NASA SP-7011 (57)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7011 (57)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during November, 1968

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. DECEMBER 1968

INTRODUCTION

Aerospace Medicine and Biology is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics (AIAA), and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. The contents of this issue are comprised of abstracts that were prepared by the three contributing organizations.

Each entry consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

a. NASA entries identified by their *STAR* accession numbers (N68-10000 series);
b. AIAA entries identified by their *IAA* accession numbers (A68-10000 series); and
c. LC entries identified by a number in the A68-80000 series.

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U.S. Government Printing Office (GPO)
Washington, D.C. 20502

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(continued)

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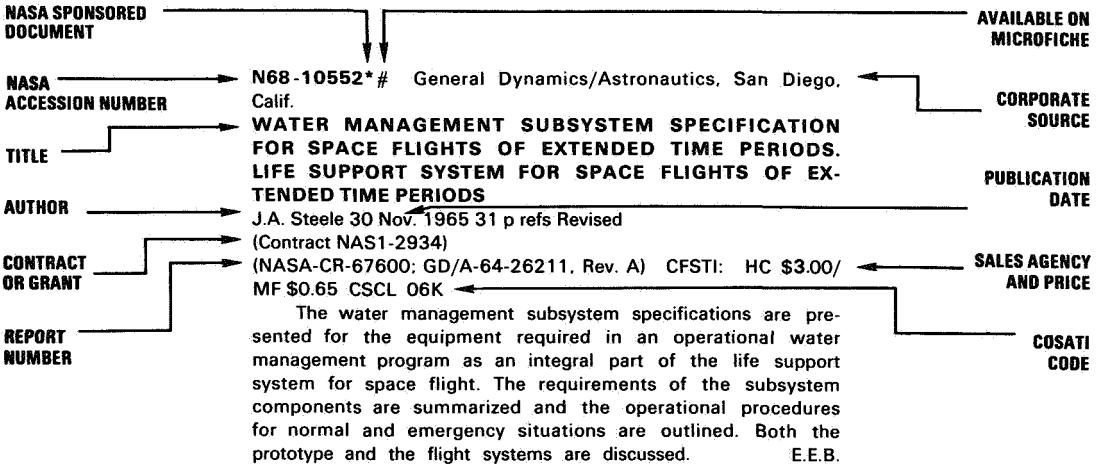

AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography DECEMBER 1968

STAR ENTRIES

N68-33655 Illinois Univ., Urbana.
VISUAL FACTORS AFFECTING THE PRECISION OF COORDINATE MEASUREMENT IN AEROTRIANGULATION
Desmond Conroy O'Connor (Ph.D. Thesis) 1967 266 p
Available from Univ. Microfilms: HC $12.15/Microfilm $3.45 Order No. 67-11894

This investigation has as its aim a study of the precision of centering black circular measuring marks in sharp circular targets simulating artificial pass points with homogeneous backgrounds of different contrasts, imaged in the vicinity of the fovea centralis. The task has been related to the general area of visual acuity, and the results confirm that the eye is remarkably sensitive to tasks of this type, threshold pointing standard deviations of the order of 0.5 seconds of arc having been obtained. The investigation goes further than recent photogrammetric tests using comparators with a least count of the order of 1 micron, which subtends a visual angle of 10 seconds at magnification 12x. Special instrumentation involving 6 meter viewing was used, with a least count of the order of 0.02 seconds of subtended angle. The results demonstrate that the precision of pointing to artificial pass points in aerotriangulation may be significantly affected by the size relationship between the measuring mark and pass point, the background density, and the adaptation level. Dissert. Abstr.

N68-33698 Northwestern Univ., Evanston, Ill.
THE EFFECT OF FLUID IN THE MIDDLE EAR CAVITY ON BONE-ELICITED COCHLEAR MICROPHONIC POTENTIALS OF THE CAT'S EAR
Craig Oliver Linnell (Ph.D. Thesis) 1967 166 p
Available from Univ. Microfilms: HC $7.80/Microfilm $3.00 Order No. 67-15278

In this study, measurements were made of cochlear microphonic (CM) magnitude and phase changes after filling the auditory bulla of the cat with mineral oil. Data were reported on twelve animals. The CM was recorded with an electrode placed in the scala tympani of the basal turn of the cochlea. Measurements were obtained by both bone and air-conducted sound stimuli over a frequency range of .2–10 kHz for pseudo-threshold changes and .2–3 kHz for phase changes. Long-term steady-state measurements were possible by blocking the Eustachian tube and sealing the auditory bulla so that the fluid remained in the cavity. Absolute (pressure and force) measures were obtained at the 3 microvolt (RMS) CM level from 200 Hz to 10 kHz with both intact and fluid-filled middle ear. The differences between these two measures were attributed to the effect of the fluid in the middle ear. Dissert. Abstr.

N68-33715*# National Academy of Sciences—National Research Council, Washington, D. C.
PHYSIOLOGY IN THE SPACE ENVIRONMENT. VOLUME 2: RESPIRATION
1967 170 p refs Conf. held Woods Hole, Mass., Jun.– Jul. 1966
(Contract NSR-09-012-036)
(NASA-CR-96635; Publ.-1485-B, V. 2) CFSTI: HC $3.00/MF $0.65 CSCL 06S

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4. PULMONARY CIRCULATION AND THE DISTRIBUTION OF BLOOD AND GAS IN THE LUNGS S. Permutt p 38–56 refs (See N68-33719 21-04)
5. REGULATION OF BREATHING J. Mead p 57–58 ref (See N68-33720 21-04)
6. EXCHANGE OF FLUIDS IN LUNGS A. B. Du Bois p 59–65 refs (See N68-33721 21-04)
7. RESPIRATORY TRACT CLEARANCE MECHANISMS FOR NONGASEOUS MATERIALS P. E. Morrow p 66–78 refs (See N68-33722 21-04)
8. DIFFUSION OF GASES IN PERIPHERAL TISSUE K. L. Zierler p 79–86 refs (See N68-33723 21-04)
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15. INFECTION J. C. Ross p 133–141 refs (See N68-33730 21-04)
16. RESPIRATORY DRUGS AND MANNED SPACE FLIGHT P. E. Morrow p 143–148 refs (See N68-33731 21-04)

N68-33716*# National Academy of Sciences-National Research Council, Washington, D. C.
STRUCTURAL CHANGES IN LUNG AND THORAX
Norman C. Staub *In its* Physiol. in the Space Environment. Vol. 2 1967 p 21–25 refs (See N68-33715 21-04)

While there is no apparent reason to expect prolonged space flight to cause changes in primary lung structure, general deconditioning of the body could extend to the thoracic cage and muscles, altering the mechanics of ventilation. Such factors as radiation, inhalation of particulates and contaminants, and possible tissue damage resulting from higher than normal P_{O_2} could lead to cellular changes in the lungs. Author

N68-33717*# National Academy of Sciences-National Research Council, Washington, D. C.
RESPIRATORY MECHANICS
Jere Mead *In its* Physiol. in the Space Environment. Vol. 2 1967 p 26–30 refs (See N68-33715 21-04)

Sufficient acceleration will limit or prevent lung movements during launch, but such periods will probably not exceed the limits of breath holding. The mechanical strength of the lung may place a limit on the accelerative forces to which the human body can safely be subjected. Probably the pulmonary blood vessels would rupture before the parenchyma tore. During zero G, changes in lung mechanics would be minimal. One would predict a decrease of about 20 percent in end-expiratory lung volume and a resulting small decrease in airway conductance. Inspiration of particulate matter might be more common, in which case the cough mechanism is more important. On theoretical grounds, the air velocity with a cough would probably be greater, but the decreased density of the gas might make the cough less effective. Author

N68-33718*# National Academy of Sciences-National Research Council, Washington, D. C.
PULMONARY GASEOUS DIFFUSION
Norman C. Staub *In its* Physiol. in the Space Environment. Vol. 2 1967 p 31–37 refs (See N68-33715 21-04)

There is no reason to suppose that gaseous-diffusion processes will be affected by zero G, unless the lung parenchyma sustains chronic or acute damage secondary to accelerations at launch or re-entry. Author

N68-33719*# National Academy of Sciences—National Research Council, Washington, D. C.
PULMONARY CIRCULATION AND THE DISTRIBUTION OF BLOOD AND GAS IN THE LUNGS
Solbert Permutt *In its* Physiol. in the Space Environment. Vol. 2 1967 p 38–56 refs (See N68-33715 21-04)

Prolonged space travel appears to offer no significant problems in this respect. On the contrary, the relations between blood flow and ventilation are likely to be optimal in the weightless state. Acceleration may produce adverse effects, however, and it is important to be able to evaluate risks and the physiological tolerances involved. Basic knowledge is needed concerning the effect of acceleration on the blood volume and capacitance of the systemic circulation, and of changes of volume in the vascular structures of the thorax presumably caused by reflex and hormonal mechanisms. The effects of gravity are so profound in altering the distribution of blood and gas within the lungs that many problems in basic pulmonary physiology can be studied more effectively under weightlessness than in a normal gravitational field. One of the dividends of space flight will be the opportunity to carry out experiments on the lungs that are impossible on earth. Author

N68-33720*# National Academy of Sciences-National Research Council, Washington, D. C.
REGULATION OF BREATHING
Jere Mead *In its* Physiol. in the Space Environment. Vol. 2 1967 p 57–58 ref (See N68-33715 21-04)

The slight alterations in pulmonary mechanics to be expected under zero G and possible deviations in inspired oxygen and carbon dioxide, depending on the composition of the cabin atmosphere, could affect the level of ventilation through well-known mechanisms. Current knowledge indicates that these effects would be too small to be physiologically significant. Minute volume tends to decrease during acceleration even to the point of apnea, but as long as its duration is brief no more serious stress than that of ordinary breath holding would exist. Hyperventilation can occur under stress, but it is not a problem unique to space flight. Author

N68-33721*# National Academy of Sciences—National Research Council, Washington, D. C.
EXCHANGE OF FLUIDS IN LUNGS
Arthur B. DuBois *In its* Physiol. in the Space Environment. Vol. 2 1967 p 59–65 refs (See N68-33715 21-04)

Fluid may enter the lungs through aspiration of secretions or by transudation from the lung capillaries. Such fluids would normally be removed by the various lung-clearing mechanisms, which should operate sufficiently well in space flight. Intentional filling of the lungs or pleural space with liquid to support the pulmonary blood vessels and lung parenchymal tissues during accelerations greater than 15 G may be tried experimentally in anticipation of life-support systems for flights far in the future and for the re-entry phase of the flight. Author

N68-33722*# National Academy of Sciences—National Research Council, Washington, D. C.
RESPIRATORY TRACT CLEARANCE MECHANISMS FOR NONGASEOUS MATERIALS
Paul E. Morrow *In its* Physiol. in the Space Environment. Vol. 2 1967 p 66–78 refs (See N68-33715 21-04)

Three physiological mechanisms keep epithelial surfaces of the respiratory tract relatively free of contaminants: (1) ciliary mucous transport, (2) endocytosis, and (3) lymphatic drainage. Ciliary mucous transport may be affected, probably slightly, by gravity and may also be influenced by the high concentration of ions presumed to exist in space capsules. In vitro and in vivo preparations exist for study of mucous transport and should be employed to test responses under appropriate conditions. There is no evidence that endocytosis is influenced by gravity, but on the other hand there is insufficient data on endocytosis in mammals. Little is known about the role and mechanism of pulmonary lymphatic drainage even under normal gravity conditions. Author

N68-33723*# National Academy of Sciences—National Research Council, Washington, D. C.
DIFFUSION OF GASES IN PERIPHERAL TISSUE
Kenneth L. Zierler *In its* Physiol. in the Space Environment. Vol. 2 1967 p 79–86 refs (See N68-33715 21-04)

If translocation of O_2 within tissues is, as most of the evidence suggests, caused purely by diffusion driven by gradients in P_{O_2}, the gravitational field or lack of it should not have any important effect on the diffusion itself. To insure adequate delivery of O_2 to the tissues, arterial capillary P_{O_2} should be maintained at the normal value at sea level. Given this condition, adequate oxygenation of tissues will depend on functional capillary blood flow, which determines the volume of tissue supplied by each capillary. The distribution of functional capillary blood flow conceivably can be affected by variations in and lack of gravity. Author

N68-33724*# National Academy of Sciences—National Research Council, Washington, D. C.
TEMPERATURE REGULATION
David Minard *In its* Physiol. in the Space Environment. Vol. 2 1967 p 99–101 refs (See N68-33715 21-04)

It is not anticipated that the role of the respiratory system as a heat exchanger will be significantly altered during space travel. If the space cabin atmosphere has a lower total pressure or uses helium as an inert gas, the decreased air density will cause a slight and physiologically insignificant decrease in body heat lost to the inspired air. Except for the possibility of heat hyperpnea under unusual or emergency situations, heat loads encountered in space travel should have minor influence on the level of minute ventilation. The possibility of untoward temperature regulation resulting from altered circulation in the weightless state is conceivable but on the basis of present knowledge is unlikely. Author

N68-33725*# National Academy of Sciences—National Research Council, Washington, D. C.
OXYGEN TOXICITY AT NEAR-NORMAL PARTIAL PRESSURES
Robert E. Davies *In its* Physiol. in the Space Environment. Vol. 2 1967 p 93–98 refs (See N68-33715 21-04)

The basic metabolic defect (or defects) associated with the physiological changes caused by O_2 toxicity are still unknown. The literature fails to demonstrate that increased inspired P_{O_2} (at least to 5 psi) is safe for prolonged use by man. Further testing for long periods with human subjects is essential before such a conclusion can be drawn. Normal (sea level) partial pressures of inspired O_2 are known to be acceptable. Reduced partial pressures may also be acceptable, and sometimes unavoidable, but the conditions and limits have yet to be pinpointed. Author

N68-33726*# National Academy of Sciences—National Research Council, Washington, D. C.
CONSIDERATIONS OF CARBON DIOXIDE CONCENTRATION
Robert E. Forster *In its* Physiol. in the Space Environmnet. Vol. 2 1967 p 99–101 refs (See N68-33715 21-04)

Ideally, from the physiological point of view, it would be best to keep inspired P_{CO_2} close to zero, as it is under normal sea-level conditions. In the manned space flights to date the circulating atmospheric P_{CO_2} has apparently been kept to less than 7.6 torr, although this may be because of engineering (thermal exchange) rather than physiological considerations. A maximum limit of 7.6 torr was chosen because chronic exposure to CO_2 concentrates just above that limit has demonstrated adaptive changes. The effect of chronic exposure to low inspired concentrations of CO_2 should be explored. Furthermore, a time-concentration-response curve exposure should be obtained to guide procedure in the event that the CO_2-removing equipment fails. Author

N68-33727*# National Academy of Sciences—National Research Council, Washington, D. C.
INERT GASES
Wallace O. Fenn *In its* Physiol. in the Space Environment. Vol. 2 1967 p 102–112 refs (See N68-33715 21-04)

Advantages of adding an inert gas or gases to the space cabin atmosphere are that (1) fire danger is reduced; (2) aural and pulmonary atelectasis is inhibited; (3) there is a possible, but unproved, long-term physiological need for at least low pressures of nitrogen; and (4) ventilation and heat dissipation within the cabin may require a total gas pressure greater than the ceiling recommended for cabin P_{O_2}. The only physiological disadvantage is the risk of the gas's producing the bends. There may be engineering disadvantages in that a double monitoring system is required and, depending on cabin leakage, there will be the extra cost of carrying a supply of inert gas. With a possible exception if absolute lack of nitrogen for long periods proves deleterious, a deficit not overcome by helium, there is little to choose between nitrogen and helium. It was concluded that some inert gas should be added, at least until an effective method of controlling fires in 100 percent oxygen becomes available. Author

N68-33728*# National Academy of Sciences—National Research Council, Washington, D. C.
TRACE CONTAMINANTS
Joseph C. Ross *In its* Physiol. in the Space Environment. Vol. 2 1967 p 113–122 refs (See N68-33715 21-04)

Because the capsule gas is recycled, contaminants that are normally present in only neglibible amounts may increase to toxic levels and may concentrate on airborne particulate matter, which in turn will be increased in the absence of the sedimentation process. All the existing and possible atmospheric contaminants in the space capsule, including gases, particles, and infectious agents, have not been identified, nor have their effective concentrations been determined. These contaminants should be monitored and regulated, pre-flight and in-flight (manned), with particular attention to contaminants produced by fire or unusual heat in the vehicle. The threshold limit value (TLV) of tolerance to various contaminants should be determined for continuous exposure, as contrasted with the more usual intermittent exposure, and the possibly additive effect of stress and infection should be included. Author

N68-33729*# National Academy of Sciences—National Research Council, Washington, D. C.
PARTICULATE MATTER: GENERAL CONSIDERATIONS AND AEROSOL DEPOSITION IN MAN
Paul E. Morrow *In its* Physiol. in the Space Environment. Vol. 2, 1967 p 123–130 refs (See N68-33715 21-04)

In zero G at hypobaric pressure, airborne stability of dusts will be affected by inertial impaction (large particles), by diffusion or deposition by Brownian motion (smallest particles), but not by sedimentation. Interception of fibers (small diameter, great length) may increase in the bronchial tree. A different distribution of aerosol deposition in the respiratory tract is thus anticipated with respect both to particle size and to site. This has important implications for production of pulmonary disability. It is recommended that studies of aerosol composition (size and association of contaminants with various particle sizes) be instituted. Moreover, tests should be made in simulated respiratory tracts to determine the size and site of deposition of aerosols under flight conditions. Additional studies of aerosol-removal methods are also indicated. Author

N68-33730*# National Academy of Sciences—National Research Council, Washington, D. C.
INFECTION
Joseph C. Ross *In its* Physiol. in the Space Environment. Vol. 2 1967 p 133–141 refs (See N68-33715 21-04)

The likelihood of microbial infections increases with (1) the size of the space crew; (2) less than ideal facilities for personal hygiene over long periods; (3) possibly altered viability of microorganisms, autoflora, and mechanisms of challenge; and (4) individual susceptibility associated with the space cabin environment. It is recommended that microbial content of the space vehicle be controlled, that consideration be given to selection of space crews on the basis of similar immunological patterns (including cross matching for blood types), and that crews be isolated as a group before the flight both to prevent exposure to infection and to allow cross-immunity to develop. Author

N68-33731*# National Academy of Sciences—National Research Council, Washington, D. C.
RESPIRATORY DRUGS AND MANNED SPACE FLIGHT
Paul E. Morrow *In its* Physiol. in the Space Environment. Vol. 2 1967 p 143–148 refs (See N68-33715 21-04)

Space flight conditions may lead to nasal congestion, obstructed sinuses, and the like, and to the increased possibility of inhaling food and large particles. Decongestants and dilators would probably be needed in such instances. Pulmonary infection would require a battery of therapeutic agents similar to those used at sea level. Otherwise, there appear to be no specific considerations peculiar to space flight. A critical review of possible problems and of the methods by which drugs have been selected, tested, and dispensed, indicates that the subject needs thorough study and, possibly, continuing evaluation by an advisory board. Author

N68-33766*# Florida Univ., Gainsville.
SOME PROPERTIES OF THE HYDROGEN BONDS IN BIOCHEMISTRY WITH PARTICULAR REFERENCE TO THE STABILITY OF THE GENETIC CODE
Per-Olov Loewdin 31 Aug. 1966 61 p refs Submitted for publication *Its* Preprint No. 98
(Grant NsG-512)
(NASA-CR-83449) CFSTI: HC $3.00/MF $0.65 CSCL 06A

An overview and analysis of the biological developments concerned with the DNA molecule are presented, with sections on the structure and stability of DNA; character of the genetic code; stability of the genetic code at replication; and internal stability of the genetic code in DNA. The stability of the genetic code, as expressed in the template idea is investigated with particular emphasis on proton changes (tunneling and jumping) between hydrogen bond electron pairs. A clarification of why spontaneous mutations are as rare as they are, and specific models for radiation or chemically induced mutations are presented. Preliminary theoretical results confirm the template idea, the importance of the H bonds in storing and transferring genetic information, and the fact that the genetic code in the Watson–Crick model has long time stability. B.P.

N68-33908 Minnesota Univ., Minneapolis.
A STUDY OF THE EFFECT OF PROFOUND LOCAL GASTRIC HYPOTHERMIA—GASTRIC FREEZING—ON THE TURNOVER OF CELLS IN THE NORMAL RAT GASTRIC MUCOSA EMPLOYING THE UPTAKE AND INCORPORATION OF TRITIUM (H-3) LABELLED THYMIDINE AS AN INDICATOR
Arthur Storer McFee (Ph.D. Thesis) 1967 133 p
Available from Univ. Microfilms: HC $6.40/Microfilm $3.00 Order No. 67-14631

A two-fold study has been carried out in rats to determine (1) the effect of gastric freezing on the development of peptic ulcers in response to stress and then to determine (2) the effect of freezing on the natural reproduction and turnover of gastric mucosal cells. In rats studied up to six weeks after freezing and paired with nonfrozen controls a significant protective effect of prior gastric freezing was shown when the rats were challanged with an ulcerogenic stimulus (starvation and cold). This effect was noted at six weeks, however, it was less than at one to two weeks after freezing. In three groups of rats studied (one hour, one week, and six weeks after freezing) by microradioautographs of the gastric mucosa after H^3 thymidine injection, no changes from a control pattern could be seen in the cellular uptake of thymidine or in the normal mucosal cell turnover. Dissert. Abstr.

N68-33909# Joint Publications Research Service, Washington, D. C.
SPACE BIOLOGY AND MEDICINE
19 Sep. 1968 174 p refs Transl. of Kosmich. Biol. i Med. (Moscow), v. 2, no. 3, 1968
(JPRS-46456) CFSTI: HC $3.00/MF $0.65

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7. DYNAMICS OF ORTHOSTATIC TOLERANCE OF ATHLETES AFTER FORTY-DAY HYPOKINESIA A. V. Korobkov, L. A. Ioffe, M. A. Abrikosova, and Yu. M. Stoyda p 48–57 refs (See N68-33916 21-04)

8. DYNAMICS OF DAILY DIURESIS, CREATININE EXCRETION AND MEAN THICKNESS OF THE FATTY SKIN LAYER IN ATHLETES SUBJECTED TO PROLONGED HYPOKINESIA A. A. Korobova and Yu. B. Vinichenko p 58–63 refs (See N68-33917 21-04)

9. EFFECT OF PROLONGED BEDREST ON MUSCLE TONE AND PROPRIOCEPTIVE REFLEXES IN MAN M. A. Cherepakhin p 64–72 refs (See N68-33918 21-04)

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13. THE CONCEPT "PERSONALITY AND ENVIRONMENT" IN EXPERIMENTAL SPACE PSYCHONEUROLOGY O. N. Kuznetsov p 96–110 refs (See N68-33922 21-04)

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18. VARIATION PULSOGRAMS AND INDICES OF THE

FUNCTION OF EXTERNAL RESPIRATION DURING EXPOSURE OF MAN TO ACUTE HYPOXIA I. R. Kalinichenko and G. A. Nikulina p 137–142 refs (See N68-33927 21-04)

N68-33910# Joint Publications Research Service, Washington, D. C.

PSYCHOMOTOR REACTIONS IN MONKEYS DURING FLIGHTS IN A BALLISTIC CURVE

R. Grandpierre *In its* Space Biol. and Med. 19 Sep. 1968 p 1–7 (See N68-33909 21-04)

Trained monkeys were exposed to weightless flight conditions and their sensory and motor spontaneous electrical potentials were registered and evaluated. Results show that several tenths of g were adequate to sustain some physiological functions; however, weightlessness caused a reduction in psychic tone as indicated by the appearance of large spindles in the monkey EEG's. All EEG's returned to normal immediately after descent to the field laboratory. G.G.

N68-33911# Joint Publications Research Service, Washington, D. C.

EFFECT OF AMOBARBITAL SODIUM AND SOMATOTROPHIC SYNDROME ON MICE DURING PROLONGED HYPOKINESIA

L. A. Kravchuk and V. G. Ovechkin *In its* Space Biol. and Med. 19 Sep. 1968 p 8–15 refs (See N68-33911 21-04)

A 35-day experiment conducted on mice exposed to hypokinesia and isolation showed that test animals differed from controls in their weight changes, mortality rate, orthostatic tolerance and sensitivity to isobarbital sodium (as judged by the mean effective dose, time of onset and duration of sleep). The preliminary administration of somatotropic hormone resulted in the prolongation of sleep induced by amobarbial soldium by three or four times, the ED_{50} of the latter remaining unchanged. Author

N68-33912# Joint Publications Research Service, Washington, D. C.

EFFECT OF HYPEROXIA ON THE HEART AND LUNGS OF WHITE RATS

A. R. Mansurov, F. V. Babchinskiy, I. G. Krasnykh, and L. A. Tyutin *In its* Space Biol. and Med. 19 Sep. 1968 p 16–21 refs (See N68-33909 21-04)

The objective of this study was an investigation of pathological changes developing in the thoracic organs of white rats as a result of their exposure to hyperoxia of different levels and durations. The changes involved focal and infiltration lesions in the lungs, exudation in the pleural cavity, segmental and lobar atelectasis, disturbed mobility of the diaphragm and increased size of the heart. An exposure of the animals to pure oxygen for 48 hours repeated four times with an interval of five days led to the development of pulmonary emphysema and functional changes of the myocardium. An exposure of animals to nitrogen (30%)-oxygen (70%) atmosphere at an altitude of 2,400 m produced pathological changes in the heart and lungs. However, they were manifested after a longer period of time than in the case of a 100%-oxygen atmosphere. A 20-day exposure to a 50% oxygen atmosphere did not result in any functional or morphological changes in the thoracic organs. Author

N68-33913# Joint Publications Research Service, Washington, D. C.

STABILIZATION OF THE CONCENTRATION OF MINERAL NUTRITION ELEMENTS IN A MEDIUM DURING PROLONGED CHLORELLA CULTIVATION WITH RECOVERY OF THE MEDIUM

Ye. K. Lebedeva, G. I. Meleshko, T. B. Galkina, and N. N. Yegorova *In its* Space Biol. and Med. 19 Sep. 1968 p 22–31 refs (See 68-33909 21-04)

It has been shown that the mineral nutrition of Chlorella during its prolonged intensive cultivation with recovery of the medium can be stabilized. The concentration of certain elements (N, P, S, Mg, K, Fe and trace elements) was maintained at a specified level by the addition of a single correcting solution whose composition fully satisfied the needs of the cells for these elements. The solution was added to the medium in small portions in accordance with the increase in biomass. Fluctuations in the concentration of the observed elements occurred due to changes in the structure of the algal population which caused alterations in cell metabolism. Author

N68-33914# Joint Publications Research Service, Washington, D. C.

STUDY OF THE OXIDATIVE-CATALYTIC METHOD FOR MINERALIZATION OF WASTES IN A CLOSED ECOLOGICAL SYSTEM

S. V. Chizhov, Yu. Ye. Sinyak, V. V. Kranoshchekov, B. G. Gusarov, S. O. Kuznetsov et al *In its* Space Biol. and Med. 19 Sep. 1968 p 32–39 (See N68-33909 21-04)

Preliminary studies of the oxidative-catalytic method for the mineralization of wastes have been made. This method is based on the pyrolytic decomposition of wastes and exposure of the pyrolysis products to oxidation in the presence of a catalyst. The optimal parameters of the process have been experimentally established: temperature in the decomposition ones—450°C and in the zone of oxide catalysts—250–300°C at normal atmospheric pressure. The nutrient solutions utilizing ash obtained from the wastes have been evaluated from the biological point of view. Mineralized products have been shown to be useful in the cultivation of lower plants (Chlorella). Author

N68-33915# Joint Publications Research Service, Washington, D. C.

MATHEMATICAL MODEL OF A LIFE SUPPORT SYSTEM

V. A. Darg and B. G. Kovrov *In its* Space Biol. and Med. 19 Sep. 1968 p 40–47 refs (See N68-33905 21-04)

This paper gives a mathematical description of a partially closed biological system. The distinguishing characteristic of the system is that it regenerates some expendables, others being stored. When optimizing the main function of the system related to its mass it is necessary to solve the following equation: $\min/x \geq 0|A(x)\,t + G(x.t)|$, where T is the lifetime of the system. It is indicated that further analysis of the suggested model is promising for the study of life support systems. Author

N68-33916# Joint Publications Research Service, Washington, D. C.

DYNAMICS OF ORTHOSTATIC TOLERANCE OF ATHLETES AFTER FORTY-DAY HYPOKINESIA

A. V. Korobkov, L. A. Ioffe, M. A. Abrikosova, and Yu. M. Stoyda *In its* Space Biol. and Med. 19 Sep. 1968 p 48–57 refs (See N68-33909 21-04)

The effect of forty-day hypokinesia on the changes of the electrocardiogram, cardiodynamics and tone of vessels of the elastic and muscular type was studied in ten highly trained athletes during their orthostatic tests. The orthostatic response exhibited an increased predominance of sympathetic effects in the heart and a reduced blood filling of the ventricles due to a deterioration of the functional state of the venous system. It was found that the stability of the latter can be maintained by means of specific training. Author

N68-33917# Joint Publications Research Service, Washington, D. C.

DYNAMICS OF DAILY DIURESIS, CREATININE EXCREATION AND MEAN THICKNESS OF THE FATTY

SKIN LAYER IN ATHLETES SUBJECTED TO PROLONGED HYPOKINESIA

A. A. Korobova and Yu. B. Vinichenko *In its* Space Biol. and Med. 19 Sep. 1968 p 58–63 refs (See N68-33909 21-04)

This study was made to determine the dyanmics of daily diuresis, creatinine excretion and mean thickness of the fatty skin layer in male athletes (runners and weightlifters) during forty-day hypokinesia. Daily diuresis was determined with an accuracy to 1 ml, creatinine was assessed by the photoelectrocolorimetric technique and the mean thickness of the fatty skin layer was measured with standard calipers. The difference between the mean values of creatinine excretion on different days of the experiment was not statistically significant. The diuresis level decreased in most test cases during the second part of the experiment. The mean thickness of the fatty skin layer increased. Insignificant fluctuations in creatinine excretion and increase in the mean thickness of the fatty skin layer indicate a reduction in protein synthesis, an increase in decomposition processes and replacement of a part of the muscle tissue by fat. The decrease in daily diuresis by the end of the experiment occurs due to a changed level of fat metabolism and the Gauer–Henry reflex. Author

N68-33918# Joint Publications Research Service, Washington, D. C.

EFFECT OF PROLONGED BEDREST ON MUSCLE TONE AND PROPRIOCEPTIVE REFLEXES IN MAN

M. A. Cherepakhin *In its* Space Biol. and Med. 19 Sep. 1968 p 64–72 refs (See N68-33909 21-04)

A 62-day experiment was carried out to study the effect of prolonged bedrest and physical exercises on the muscle tone and proprioceptive reflexes in man. One group of test subjects performed physical exercises in a prone position. The exercises were performed for 2 1/2 hours daily with an intensity 600–1,200 kgm/min. The prolonged bedrest experiment reduced the muscle tone in the test subjects, particularly in those who performed no physical exercises. The decrease in muscle tone produced no effect on the proprioceptive reflexes, their latent periods being dependent on the length of the reflex path. Author

N68-33919# Joint Publications Research Service, Washington, D. C.

EFFECT OF HYPOKINESIA ON HUMAN CIRCULATION

V. S. Georgiyevskiy and V. M. Mikhaylov *In its* Space Biol. and Med. 19 Sep. 1968 p 73–78 refs (See N68-33909 21-04)

The combined effect of bedrest and accelerations on human circulation was studied using mechano- and polycardiographic techniques. The experiments were conducted on young healthy male test subjects. The experiments demonstrated an increase in heart rate and average blood pressure, a decrease in the ejection period and development of orthostatic hypotension. Variations in some hemodynamic indices indicated a phasic pattern reaching a maximum on the 32d–42d day. Author

N68-33920# Joint Publications Research Service, Washington, D. C.

NEUROLOGICAL CHANGES IN HEALTHY SUBJECTS INDUCED BY TWO-MONTH HYPOKINESIA

Yu. N. Purakhin and B. N. Petukhov *In its* Space Biol. and Med. 19 Sep. 1968 p 79–85 refs (See N68-33909 21-04)

Six healthy male test subjects were twice exposed to accelerations followed by a 62-day bedrest during which three test subjects performed physical exercises of a known intensity. The study included tests of the nervous system, electroencephalographic recordings, physiological tremor and fluctuations of the body center of gravity (stabilography). During the first two weeks of the experiment the test subjects exhibited symptoms of asthenic reactions in their behavior and nervous system. Later the symptons become more serious, acquiring the form of neurological symptoms and an asthenic syndrome (neurasthenia). An analysis of data on the tremor, electroencephalogram and stabilography also indicated the development of changes in the central nervous system, autonomic nervous system and orthostatic tolerance in response to long-term hypokinesia. Functional shifts were accompanied by morphological changes in the muscular system. Author

N68-33921# Joint Publications Research Service, Washington, D. C.

ARTERIAL TONE IN RELATION TO RESTRICTED MUSCULAR ACTIVITY

N. Ye. Panferova and V. A. Tishler *In its* Space Biol. and Med. 19 Sep. 1968 p 86–95 refs (See N68-33909 21-04)

Experimental data are presented concerning the dynamics of some indices characterizing arterial tone prior to, during and following 5- to 20-day exposure of sixteen test subjects to hypodynamia or relative physiological rest (in a chair or bed). Recordings were made of the velocity of the pulse wave distribution in the aorta and vessels of the arm and leg; calibrated pulse amplitude of the vessels of the second and fourth fingers and toes (mm^3); skin temperature of the chest, forehead, back of the hand and foot and front part of the shin. Before and after the experiment the test subjects underwent 15- to 2-minute tilt table tests during which time the above indices were recorded. It was found that hypodynamia resulted in an increased constriction of vessels in the lower extremities, including skin arterioles, whereas the tone of the aorta and arm vessels remained virtually unchanged. The construction of the leg vessels was more pronounced during the post-experiment orthostatic tests in comparison with that observed prior to the experiment. Author

N68-33922# Joint Publications Research Service, Washington, D. C.

THE CONCEPT "PERSONALITY AND ENVIRONMENT" IN EXPERIMENTAL SPACE PSYCHONEUROLOGY

O. N. Kuznetsov *In its* Space Biol. and Med. 19 Sep. 1968 p 96–110 refs (See N68-33909 21-04)

This paper discusses the significance of adaptation of the personality to various environments. It covers the subject and technique of experimental space psychoneurology and its role in psychoneurological examinations of human behavior during a space mission. The paper includes tables indicating unusual psychic states and psychopathological syndromes exhibited by test subjects during surdochamber experiments. They are given differential diagnoses in relation to particular environmental effects. On the basis of data in the literature and the author's own findings there is discussion of peculiarities of the personality promoting or hindering adaptation to various environments. Prolonged confinement of test subjects in isolation in surdochambers is shown to be a promising method for studying individual behavioral characteristics of the personality. Author

N68-33923# Joint Publications Research Service, Washington, D. C.

MECHANISMS OF THE EFFECT OF STRONG LIGHT STIMULI ON THE OPTIC ANALYZER

V. I. Shostak *In its* Space Biol. and Med. 19 Sep. 1968 p 111–116 refs (See N68-33909 21-04)

After an experimental flash (duration 2.1 msec, luminosity $7.8 \cdot 10^7$ nit) the recovery of light sensitivity and the b-wave component of the electroretinogram were determined during the course of adaptation to the dark which followed. The two values were closely correlated, giving evidence of the leading role played by peripheral processes in the mechanisms of adaptation to the dark. On the basis of a two-page regression curve the author derived two regression equations for different phases of adaptation to the dark. The curve showing adaptation to the dark which was

constructed using these equations reveals the possibility of applying equations of this kind for an objective determination of light sensitivity and the modeling of the process of adaptation to the dark. Author

N68-33924# Joint Publications Research Service, Washington, D. C.
HUMAN LIMITS OF TOLERANCE TO INFRARED RADIATION DURING LOCAL IRRADIATION
I. I. Dedenko, N. K. Gnoyevaya, and V. S. Ivanov *In its* Space Biol. and Med. 19 Sep. 1968 p 117–123 refs (See N68-33909 21-04)

An attempt has been made to establish quantitative indices of human tolerance to infrared irradiation to be correlated with radiation intensity and the irradiated body area. The pain thresholds for temperature effects have been shown to be not dependent on the absolute skin temperature but on the rate of its increase. The higher the irradiation intensity, the lower is the absolute temperature at which a feeling of intolerable pain appears. Author

N68-33925# Joint Publications Research Service, Washington, D. C.
EFFECT OF PLANT DIETS, INCLUDING THE BIOMASS OF UNICELLULAR ALGAE, ON THE BALANCE AND EXCRETION OF MINERAL ELEMENTS
Ye. I. Pokrovskaya, A. P. Tereshchenko, and V. M. Volynets *In its* Space Biol. and Med. 19 Sep. 1968 p 124–128 refs (See N68-33909 21-04)

A 30-day experiment performed on five healthy male test subjects has demonstrated that plant diets including about 120 g of dry Chlorella biomass decrease the assimilation of calcium and magnesium and produce an insignificant negative balance of these elements on the twentieth–thirtieth day. The assimilation of potassium and phosphorus undergoes no changes and their balance remains positive throughout the experiment. Author

N68-33926# Joint Publications Research Service, Washington, D. C.
EVAPORATION UNDER LOW ATMOSPHERIC PRESSURE CONDITIONS
I. N. Chernyakov, I. V. Maksimov, and P. Ya. Azhevskiy *In its* Space Biol. and Med. 19 Sep. 1968 129–136 refs (See N68-33909 21-04)

Water losses by man wearing a pressurized suit with an oxygen mask were studied. The evaporation level was determined from changes in skin temperature and heat flux measured using a special device. Experiments were made at altitudes of 20,000 m and above. It was found that vacuum evaporation occurred from parts of the body covered by the pressurized suit. The evaporation decreased skin temperature, increased heat flux and caused a feeling of cold in test subjects. Vacuum evaporation results from an atmospheric pressure decrease down to the saturated vapor elasticity value at skin temperature, body surfaces being in contact with the ambient atmosphere through linen and suit pores. Human water losses through vacuum evaporation at altitudes of 20,000 m and above, at comfortable temperatures and at rest amount to 100 g/hour, remaining below the detrimental limit. Author

N68-33927# Joint Publications Research Service, Washington, D. C.
VARIATION PULSOGRAMS AND INDICES OF THE FUNCTION OF EXTERNAL RESPIRATION DURING EXPOSURE OF MAN TO ACUTE HYPOXIA
I. R. Kalinichenko and G. A. Nikulina *In its* Space Biol. and Med. 19 Sep. 1968 p 137–142 refs (See N68-33909 21-04)

The health of a subject exposed to accute hypoxia (two-hour enclosure at an altitude of 5,000 m without an additional oxygen supply) was determined using variation pulsograms. Indices of the function of external respiration and pulmonary gas exhange provided additional information. The experiments were conducted on six healthy male test subjects before and after their 36-hour exposure to a modified work and rest schedule. The study revealed that the health of a subject exposed to acute hypoxia can be determined using variation pulsograms. Author

N68-33936*# Stanford Univ., Calif. Inst for Mathematical Studies in the Social Sciences.
SEARCH AND RETRIEVAL PROCESSES IN LONG-TERM MEMORY
Richard M. Shiffrin 15 Aug. 1968 138 p refs
(Grant NGR-05-020-244)
(NASA-CR-96549; TR-137) CFSTI: HC $3.00/MF $0.65 CSCL 05J

A theory of storage and retrieval in long-term memory is presented; and applications and extensions are discussed in terms of recognition and recall, ranking, second-guessing, interference phenomena, and latencies exhibited in two experiments. The first deals with the probabilistic nature of retrieval and the forgetting of individual items; the second with intrusion phenomena in responding and with interference phenomena following the altering of the response assigned to a stimulus. It was found that second-guessing probability could be considerably above chance even when responses ranked after the first choice were correct at the chance level; and this was interpreted to imply that the subjects used a retrieval strategy which outputs the first acceptable response covered in the memory search. Second-guessing is based on an additional search of memory and may, therefore, be above chance. Any model that assumes a long-term absorbing state is not considered appropriate for representing the memory process in such cases. An overall proactive effect was found to be present for both the probabilities of a correct response and an intrusion. The model used emphasized an ordered search through a small subset of stored codes. M.W.R.

N68-33975 Oregon Univ., Eugene.
ANALYSIS OF LINE LENGTH BY THE HUMAN VISUAL SYSTEM
Thomas Lloyd Harrington (Ph.D. Thesis) 1967 84 p
Available from Univ. Microfilms: HC $4.40/Microfilm $3.00 Order No. 67 67-16164

Subjects were required to find, as quickly as possible, a long line in an array of randomly oriented short lines. These short background elements were of uniform length, but of different widths. One-third had the same width as the long element, one-third the same shape and one-third the same area. Thus the subjects were prevented from searching out the long element on the basis of these characteristics, which normally vary with length. The area of the array, the number of elements in it and the size of the elements all were varied to determine how these parameters affect the obviousness or distinctness of the long element. Latencies were taken and ratings of the obviousness of the long element were obtained from the subjects. It was found that the area of the field of elements had no effect on the distinctness of the disparate line. Decreasing the number of elements or increasing the size of the elements made the longer element stand out more emphatically. Dissert. Abstr.

N68-34004*# National Aeronautics and Space Administration, Washington, D. C.
LIFE CYCLE AND RAPID CHANGING OF ZONE TIMES DURING AERIAL TRAVEL [RYTHME DE VIE ET CHANGEMENTS RAPIDES DE FUSEAUX HORAIRES AU COURS DES VOYAGES AERIENS]
J. La Vernhe Aug. 1968 12 p refs Transl. into ENGLISH from Presse Med. (Paris), v. 72, no. 44, 24 Oct. 1964 p 2623–2626
(NASA-TT-F-11723) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Time displacement during air travel causes an interruption of the nychthemeral cycle, which in turn causes biological ill-effects. Commercial flying crews experience mainly fatigue and digestive disorders. The best ways for overcoming these two ill-effects are discussed. Author

N68-34009# Royal Aircraft Establishment, Farnborough (England).
A TEMPERATURE SENSING SUIT
C. B. Bolton and R. E. Simpson Nov. 1967 13 p
(RAE-TR-67280) CFSTI: HC $3.00/MF $0.65

This report describes a temperature sensing garment which, by changes of electrical resistance with temperature, permits measurement of skin or skin micro-climate temperature to be taken with reasonable reproducibility. It is sufficiently robust to be used during field trials and has fair accommodation to wearers of differing stature. The same methods of construction could probably be used for an electrical resistive heating garment. Author (ESRO)

N68-34013*# San Jose State College, Calif. Dept. of Psychology.
FACTORS INFLUENCING THE PERCEPTION OF ANGULAR ACCELERATION IN MAN Semiannual Status Report
Brant Clark Aug. 1968 14 p refs
(Grant NGR-05-046-002)
(NASA-CR-96631; SASR-2) CFSTI: HC $3.00/MF $0.65 CSCL 06S

The objective of this research was to investigate the nature of the perception of angular acceleration in normal men during and following rotation. Whereas the majority of the earlier studies have been primarily concerned with physical models and the physiological mechanisms of the semicircular canals, this project has been concerned with man's subjective reactions to angular acceleration. Using the MCRD and a psychophysical method developed at Ames Research Center, work has been carried out to determine the range of sensitivity for angular acceleration in normal men. In addition, the effects of duration of stimulation, presence of visual targets in the field, axis of rotation and suprathreshold stimulation by angular acceleration have been studied. The work has resulted in reports at two meetings; two studies are in the final stages of data collection and preparation of the reports is well advanced; and one thesis study is complete and submitted for publication while the other is in the final stage of writing. Author

N68-34016*# Research Triangle Inst., Durham, N. C. Engineering and Environmental Sciences Div.
BIOMEDICAL APPLICATIONS OF NASA SCIENCE AND TECHNOLOGY Final Report, 15 Jun. 1967–14 Jul. 1968
14 Jul. 1968 70 p refs
(Contract NSR-34-004-045)
(NASA-CR-96613; EU-349) CFSTI: HC $3.00/MF $0.65 CSCL 06S

An overview is presented on the activities of the three multidisciplinary Biomedical Applications Teams who are participating in efforts to facilitate the transfer of scientific and technological information to clinicians and medical researchers. In discussing the 24 technology transfers and the 12 potential transfers, the problem and the solution are detailed, the searching method and source of solution are identified, the actual or potential benefits resulting from the transfer are assessed, and the status of the transfer is given. Also listed are the active problems for which solutions are being sought. It is reported that 28 computerized information searches and search up-dates of the aerospace literature were performed. M.G.J.

N68-34044*# Allis-Chalmers Mfg. Co., Milwaukee, Wis. Advanced Electrochemical Products Div.
DESIGN AND FABRICATION OF A WATER ELECTROLYSIS UNIT FOR AN INTEGRATED LIFE SUPPORT SYSTEM Final Report, 6 Aug. 1966–31 May 1968
A. P. Antony Aug. 1968 67 p ref
(Contract NAS1-6561)
(NASA-CR-66654) CFSTI: HC $3.00/MF $0.65 CSCL 06K

A four-man water electrolysis unit providing 8 pounds of oxygen per day is described. Tests included a 250 hour unit demonstration. Electrical efficiency was 76% based on average cell voltages and the 1.23 volts per cell theoretically required for water electrolysis. Total power input was 960 watts; 800 watts were used for electrolysis and the remainder for heaters and accessories. Power sources were 28 volt dc and 115 volt 400 Hertz. Oxygen and hydrogen purities were greater than 99.95% based on analysis by gas chromatograph and mass spectrometer. The unit design is based on zero-g requirements. Potassium hydroxide (KOH) at a nominal concentration of 35% is maintained in an asbestos matrix for electrolysis. Water feed is by vapor diffusion across the hydrogen gas passage. The unit consists of 3 modules of 16 cells each. Cell subassemblies are of laminated and bonded polysulfone with "O" ring seals to integral module manifolds for feed water and product gases. Unit weight was 160 pounds, volume 4.4 cubic feet. Significant reductions could be made in weight and volume for a flight-prototype unit. Author

N68-34176# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACADEMY OF SCIENCES OF THE USSR. NEWS: BIOLOGICAL SERIES
25 Oct. 1967 34 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSR, Ser. Biol. (Moscow), no. 3, 1967 p 339–350, 396–403
(FTD-MT-24-244-67; AD-671952)

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N68-34177# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BIOCHEMICAL BASES OF THE REGULATION OF THE SPEED OF GROWTH OF MICROORGANISMS [BIOKHIMICHESKIYE OSNOVY REGULYATSII SKOROSTI ROSTA MIKROORGANIZMOV]
N. D. Iyerusalimskiy *In its* Acad. of Sci. of the USSR. News: Biol. Ser. 25 Oct. 1967 p 1–14 refs (See N68-34176 21-04)

The question of the kinetics of metabolic processes, lying at the basis of the biosynthesis of proteins and nucleic acids is examined. The speed of formation of these most important biopolymers determines the speed of cell growth. The dependence between the speed enzymatic reactions and the concentration of the components of these reactions is described by simple equations of the Michaelis-Menten type. Equations of a similar kind are applicable also for the characteristics of complicated, multistage biosynthetic processes. This is explained by the fact that the speed of such complex processes is determined by the speed of the individual enzymatic reactions which occur slower than the others and are "bottlenecks" of the given complex of reactions. That circumstance that the dependence between the composition of the medium and the vital functions of the microorganisms, including the growth of cells, in a number of cases can be described by simple equations facilitates very much the mathematical modeling of the microbiological processes and permits the conscious control of their behavior, by maintaining with this goal the corresponding conditions of cultivation. Author

N68-34178# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE DYNAMICS OF PULSE WAVES OF INTRACRANIAL PRESSURE DURING TRANSVERSE OVERLOADS UP TO 40 g [DINAMIKA PUL'SOVYKH VOLN VNUTRICHEREPNOGO DAVLENIYA PRI POPERECHNYKH PEREGRUZKAKH DO 40 YED]

Yu. Ye. Moskalenko, O. G. Gazenko, G. B. Vaynshteyn, and I. I. Kas'yan *In its* Acad. of Sci. of the USSR. News: Biol. Ser. 25 Oct. 1967 p 15–24 refs (See N68-34176 21-04)

The conducted experiments showed that during transverse loads up to 15 g the pulse waves of intercranial pressure (PW ICP) decrease in amplitude. This depends mainly on the decrease of the beat volume of the heart during such overloads, and, thus, the general hemodynamic shifts predominate over the disturbances in the system of intracranial blood circulation which by themselves would give a growth of amplitude to the PW ICP. An increase in certain experiments of the amplitude of the PW ICP during loads up to 10 g, observed in a number of experiments, apparently was connected with the predominant influence in these cases of the intracrania factors on the parameters of the PW. Increase of the PW ICP during growth of the overloads above 25 g (after they became inconspicuous on overloads of the order of 15 g) witnesses either about certain restoration of the hemodynamic parameters of pulmonory circulation, or about the appearance of the intrinsic pulsation of the blood vessels, synchronous with the rhythm of the heart. In the period of the aftereffect, there was observed a period of growth of the PW ICP with characteristic simplification of their form, which was caused by residual hypoxia of the cerebral tissue after the overload. Author

N68-34245*# Pennsylvania State Univ., University Park. Dept. of Geochemistry and Mineralogy.

ABSORPTION OF PYRIMIDINES, PURINES AND NUCLEOSIDES BY Li, Na, Mg, and Ca MONTMORILLONITE (CLAY ORGANIC STUDIES 12)

G. E. Lailach, T. D. Thompson, and G. W. Brindley [1967] 26 p refs Presented at the 16th Natl. Clay Conf., Denver, 28–31 Aug. 1967 Submitted for publication

(Grant NGR-39-009-015)

(NASA-CR-89254) CFSTI: HC$3.00/MF$0.65 CSCL 06A

The absorptions of the biologically important purines adenine and hypoxanthine, the pyrimidines cytosine, thymine, and uracil, and the nucleosides adenosine, guanosine, inosine, cytidine, thymidine, and uridine by Li–, Na–, Mg–, and Ca–montmorillonite have been studied in aqueous solutions over a range of pH values 2-12. The initial organic concentrations were between 0.8 and 1.4 m.molar. The ratio clay to organic compounds was such that only up to 30% of the exchange capacity could be saturated by organic cations, but, depending on conditions, up to 100% of the available organic material was absorbed. The results show that absorption occurs primarily as a cation exchange reaction. Thymine, uracil, and their nucleosides are not absorbed under the experimental conditions. The absorption of the other compounds at various pH's depends on their basicity, their aromatic or non-aromatic character and the possible extent of the van der Walls interaction with the silicate layers. Author

N68-34262*# TRW, Inc., Cleveland, Ohio. Mechanical Products Div.

ON-BOARD AIRCRAFT OXYGEN GENERATING SYSTEM

R. J. Kiraly, A. D. Babinsky, and P. D. Quattrone (NASA. Ames Res. Center) 13 Sep. 1968 29 p refs

(Contract NAS2-4444)

(NASA-CR-73229) CFSTI: HC$3.00/MF$0.65 CSCL 06K

An on-board aircraft oxygen generation system is being developed. Oxygen is generated by water electrolysis and carbon dioxide is removed from the rebreather loop by an electrochemical carbon dioxide concentrator. The design objectives are to develop a safe, reliable, compact system which would replace the present LOX system, thereby minimizing the need for ground support facilities, and reduce time and effort required for servicing. The only periodic servicing required is to refill a water reservoir between flights. The system, with the rebreather loop, requires only the generation of oxygen at a rate equal to approximately 1.5 times that metabolically consumed by the user. This system is also applicable for use in closed environments such as spacecraft and submarines. This paper describes the oxygen system and its design. Projected sizes and weights for a fully-developed prototype are presented. Other applications are discussed. Author

N68-34324*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

ANALYTICAL SIMULATION OF AN INTEGRATED LIFE SUPPORT SYSTEM

O. Karl Houck Jun. 1968 16 p refs Presented at the ASME Ann. Aviation and Space Div. Conf., Beverly Hills, Calif., 16–19 Jun. 1968

(NASA-TM-X-61232) CFSTI: HC$3.00/MF$0.65 CSCL 06K

A digital computer program which solves thermodynamic–chemical equilibriums of an integrated life support system (ILSS) is discussed and the system, which is simulates, is described. Comparisons of ILSS test results with various simulation cases are made. Analytical trade-off studies for spacecraft atmosphere temperature and oxygen recovery are presented. Studies that have been made are fairly accurate and provide substantiation of life support research. Author

N68-34345*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AN IMPLANTABLE MULTI-CHANNEL TEMPERATURE TRANSMITTER

T. B. Fryer, C. M. Winget, and J. M. Pope [1967] 3 p refs Presented at the Conf. on Eng. in Med. and Biol., 20th Ann. Meeting, Boston, 13–16 Nov. 1967

(NASA-TM-X-61199) CFSTI: HC$3.00/MF$0.65 CSCL 06B

A multichannel transmitter suitable for the simultaneous measurement of four independent temperatures has been designed and constructed. The low power consumption and small size make this unit suitable for use in chronic implant experiments. The measurement of body temperature via radio telemetry has proved useful in many physiological experiments, especially the study of circadian rhythms where the animal must be monitored continuously without outside influences. Single-channel systems for this purpose have been reported and widely used. Because of the significant temperature gradients that exist in the body it was deemed desirable to measure a number of temperatures simultaneously for a more complete study of the mechanisms involved in circadian rhythms. Author

N68-34380*# Stanford Research Inst., Menlo Park, Calif.

SOME MAJOR IMPACTS OF THE NATIONAL SPACE PROGRAM. 6: PUBLIC HEALTH, MEDICINE, AND BIOLOGICAL RESEARCH

R. W. Prehoda Jul. 1968 87 p refs

(Contract NASw-1722; SRI Proj. MU-7227)

(NASA-CR-96811) CFSTI: HC$3.00/MF$0.65 CSCL 06E

Manned space missions have caused the normal healthy adult to be intensively studied, in contrast to past biomedical research which principally centered on adults suffering from disease. These base-line clinical data cover almost every environmental parameter, permitting deviations from the norm to be better measured in disease and also allowing optimum performance standards to be set in many occupations. The impact on biomedical research techniques has been a positive achievement, especially where nonspace R&D is conducted by groups also engaged in bioastronautics. The use of the computer and mathematical models

for biological systems has been refined in space R&D and is now widely employed. The research technique transfer includes use of digital computer processing and enhancement of X-ray and microscope photographs in medical diagnosis. The transfer of specific hardware items developed for space programs or related research has been unexpectedly slow. There is a very serious time gap between the acceptance at the clinical testing level and the widespread distribution of the system in medicine where the user requirements are to be found. Author

N68-34385# Aviation Safety Engineering and Research, Phoenix, Ariz.
CRASHWORTHINESS OF AIRCREW PROTECTIVE ARMOR
Joseph L. Haley, Jr., Clifford I. Gatlin, and James L. Schamadan Apr. 1968 132 p refs
(Contract DAAG17-67-C-0138)
(TR-68-57-CM; AD-672504)

The results of a test program conducted to determine the physiological effects of personnel armor on aircrew members exposed to an aircraft crash environment are presented. Emphasis was placed on the effects of armor as worn by air crews in current military operations. The program was divided into two major tasks. The first included a literature search to obtain design data on human injury simulation techniques, a conference to obtain information from a group of combat-experienced US Army medical helicopter crewmen on the impact behavior of the armor in observed accidents, and modifications to anthropomorphic dummies to effect recordings of mechanical injuries to vital body areas. The second task consisted of three types of dynamic tests: vertical drop tower tests, horizontal accelerator tests, and a full-scale helicopter crash test. Test results indicated that the potentially dangerous effects of the armor during a crash situation are relatively few. The most serious problem appears to be the possible collapse of the trachea following an impact of the upper edge of the armor with the front of the neck. Author (TAB)

N68-34400*# Battelle Memorial Inst., Richland, Wash. Pacific Northwest Lab.
COSMIC RAY INDUCED RADIOACTIVITY IN ASTRONAUTS AS A MEASURE OF RADIATION DOSE (a)
R. L. Brodzinski, N. A. Wogman, and R. W. Perkins 1 Sep. 1968 15 p refs
(Contracts NAS9-7095; AT(45-1)-1830)
(NASA-CR-73251; BNWL-SA-1921) CFSTI: HC $3.00/MF $0.65 CSCL 06R

The activity-dose energy relationships for ^{7}Be, ^{13}N, ^{22}Na and ^{24}Na activities induced in muscle tissue by proton bombardment were measured through the energy range up to 580 MeV. The relationship between radiation dose and induced activity for any given proton bombarding energy is defined. The determination of the radiation dose received by an astronaut from cosmic radiation of unknown energy by measuring the concentrations of the radioactive isotopes induced in his body is discussed. Author

N68-34419* National Aeronautics and Space Administration, Washington, D. C.
LIFE SUPPORT SYSTEM MANNED TESTING WITH OXYGEN AND WATER RECOVERY
A. L. Ingelfinger, T. C. Secord, (McDonnell-Douglas Co.), and W. F. Arndt, Jr. (McDonnell-Douglas Co.) [1968] 4 p ref Presented at the 1968 Ann. Aerospace Med. Assoc. Meeting, Bal Harbor, Fla., 6–9 May 1968
(NASA-TM-X-61179)

Test data are presented on the advanced life support system which was integrated and installed in the space cabin simulator for the crew to operate, repair, and maintain under conditions comparable to those encountered by an earth orbital laboratory. Major emphasis is placed on the water and oxygen regeneration systems. A wick evaporator system was used to regenerate water from urine and cabin condensate water from four crewmen; the water was used for drinking and reconstituting freeze-dried food. Results show that the completely automatic urine feed system and pretreatment functioned perfectly with no sign of wick flooding. Oxygen recovery was achieved by using a Sabatier reactor unit. The CO_2 was transferred from an improved regenerative molecular sieve system; the water from the Sabatier process was transferred to an electrolysis unit where O_2 was recovered and returned to the cabin, with the H_2 returned to the Sabatier unit. Also mentioned are the problems involved in trace contaminant and microbial control, and the piggy back equipment used in the experiment. M.G.J.

N68-34420# Army Aeromedical Research Unit, Fort Rucker, Ala.
PAINTED HELICOPTER MAIN ROTOR BLADES AND FLICKER-INDUCED VERTIGO
James A. Bynum and John A. Stern (Washington Univ., St. Louis) Jun. 1968 22 p refs
(USAARU-68-11; AD-672514)

Painting the main rotor blades of UH-1 helicopters led to the question of the possibility of flicker-induced vertigo in formation flights involving these helicopters. In the first of two experiments designed to answer the question, subjective responses of 38 instructors and students were obtained and evaluated after their participation in formation flights in helicopters with painted blades. In the second experiment, 10 student pilots were screened from a group of 37 on the basis of their psychophysiological and subjective responses to photic stimulations in the laboratory. These ten then flew in formations while EEG, EOG, and eye blink data were recorded during the flight and they were debriefed immediately following the flight. Results of both experiments did not indicate the painted blades to be a source of flicker vertigo. Author (TAB)

N68-34494*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CURRENT RESEARCH ON REGENERATIVE SYSTEMS
Jacob Shapira, Adrian D. Mandel, Phillip D. Quattrone, and Nancie L. Bell 16 May 1968 9 p refs Presented at COSPAR 11th Ann. Meeting, Tokyo, 9–21 May 1968
(NASA-TM-X-61201) CFSTI: HC $3.00/MF $0.65 CSCL 06M

Multiple studies directed toward the development of a regenerative life support system have shown that easily synthesized organic compounds and microbiological materials are potentially capable of being used as foods for long duration space missions. The organic compounds presently believed to offer the greatest potential are glycerol, simple glycerol derivatives such as triacetin, and formose sugars. Laboratory studies indicate that glycerol can be synthesized from formaldehyde which in turn is obtained by the direct catalytic oxidation of methane, a by-product of the Sabatier reaction used in the spacecraft atmosphere control system. Formose sugars are derived from the self condensation of formaldehyde. Mixtures of glycerol and triacetin have been shown to be suitable as a major component of diets fed to weanling rats for prolonged periods. *Hydrogenomonas eutropha* is the microbiological system under investigation. Nutritional evaluation of *Hydrogenomonas* bacteria has shown they are capable of supplying the total protein requirement of growing rats for prolonged periods. The potential and problems of these regenerative systems and the prospects for the accomplishment of a totally regenerative food system will be Author

N68-34515# Honeywell, Inc., St. Paul, Minn. Research Dept.
A STUDY OF VISUAL SEARCH USING EYE MOVEMENT RECORDINGS: VALIDATION STUDIES Annual Report, 1 Jan.–31 Dec. 1967
L. G. Williams, W. H. Jack, W. D. Shontz, D. Hawthorne, and J. Juola 20 Jun. 1968 51 p
(Contract Nonr-4774(00))
(AR-3; Rept.-12009-IR-4; AD-672184)

The document covers a program of study of the visual search process. During previous experimentation, peripheral discrimination gradients have been determined for several stimulus attributes -- color, size, shape, and lightness. The present study attempted to validate the predictive capacity of the data base and a model of visual search. Two experiments were conducted. In the first experiment, subjects searched for information in a variety of actual map segments. The predictions were found to have very little relationship to the obtained search times. Several possible reasons for failure of the model are discussed. In the second experiment, predictions were made of the time required to find targets in relatively unconstrained abstract fields containing many objects of different size or different color. Here the models predictions were quite precise. It was concluded that, for accurate prediction of search times in complex situations, as represented by information to be located in maps, more information is required about two aspects of the search process -- the effect of target visibility and the peripheral discriminability of alphanumerics. Author (TAB)

N68-34521*# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

INDUCED RADIONUCLIDES IN ASTRONAUTS Final Report, 15 Jun. 1967–1 Sep. 1968

R. L. Brodzinski, N. A. Wogman, and R. W. Perkins 1 Sep. 1968 58 p refs

(NASA ORDER A-97095; Contract AT(45-1)-1830)

(NASA-CR-73252; BNWL-5314) CFSTI: HC $3.00/MF $0.65 CSCL 06R

Activity–dose energy relationships for Be 7, N 13, Na 22, and Na 24 activities induced in unshielded muscle tissue by bombardment with protons of up to 580 MeV were measured. The relationship between radiation dose and induced activity for any given proton bombardment energy is defined and established for unshielded tissue samples the size of the thoracic region of a man. The determination of the radiation dose received by an astronaut from cosmic radiation of unknown energy by measuring the radioactive isotope concentration in his body is discussed. Two studies are briefly described which deal with measurement of induced radioactivity in humans irradiated for therapeutic purposes and measurement of cosmic ray neutron flux in high-altitude pilots. Tabulated data resulting from the experiments and a 67-title bibliography are included. K.W.

N68-34525# National Academy of Sciences–National Research Council, Washington, D. C.

VISION RESEARCH: FLYING AND SPACE TRAVEL

Milton A. Whitcomb, ed. and William Benson, ed. 1968 221 p refs Proc. of Spring Meeting, 1964

(Contract Nonr-2300(05))

(AD-669266) CFSTI: HC $3.00/MF $0.65

CONTENTS:

N68-34526# Michigan Univ., Ann Arbor. Sensory Intelligence Lab.

CRITERIA FOR LABORATORY EXPERIMENTS USEFUL IN FIELD SITUATIONS

Wilson P. Tanner, Jr. *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 3–15 refs (See N68-34525 21-05)

(Grant AF-AFOSR-367-63)

An explanation of the establishment of criteria for the design of laboratory experiments useful to field situations is presented. The first step, that of describing the current state of knowledge, is accomplished by stating a set of possible hypotheses to which an associated probability or degree of belief is assigned. The space in which these hypotheses exist is then described in terms of a set of orthogonal dimensions spanning the spaces. The size of the experiment necessary to assign coefficients to the orthogonal dimensions within a predetermined level of confidence is then determined. The procedure is illustrated in an experiment on memory in psychophysical tasks, and the problem of the interpretation of data obtained from experiments on vigilance is discussed. In conclusion, it is reemphasized that the most important factor is a precise statement of the problem to be studied. Author

N68-34527*# Presbyterian Medical Center, San Francisco, Calif. Eye Research Inst.

VISUAL FITNESS FOR SPACE TRAVEL

Arthur Jampolsky, Ailene Morris, and Carter Collins *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 16–18 (See N68-34525 21-05)

Challenges currently presented in experimental determinations of visual fitness criteria and selection standards for space travel are assessed. Focused on are problems related to determining (1) the visual capabilities that are required for space travel; (2) how to provide for unpredictable stresses on an already overloaded man confronted with a mortal dilemma; and (3) how to evaluate and select the man who can meet novel and unknown crises which may involve critical visual performance. To overcome these inherent problems it is proposed that (1) new tests be developed that are adapted to dynamic stress situations rather than to static situations, and (2) these tests be focused on what should be done rather than what can be done. S.C.W.

N68-34528*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

THE EFFECT OF FLASH DISTRIBUTION AND ILLUMINANCE LEVEL UPON THE DETECTION OF LOW INTENSITY LIGHT STIMULI

Richard E. Wienke *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 19–30 refs (See N68-34525 21-05)
CSCL 05H

The proportion of light flashes detected by naive subjects was determined as a function of two flash groupings and two levels of flash intensity. One flash grouping, the "massed" condition, consisted of two groups of six flashes. The flashes were presented at the rate of 1 flash/sec with about 1° of arc separations. The groups were separated by approximately 90 sec of time and 90° of arc. The second, or "distributed" condition, consisted of 12 flashes presented at the rate of 1 flash/each 10° of arc and 10 sec of time. The illuminance-level of these two conditions was equivalent to 0.13/kmc. One group of subjects was run under the distributed condition when the illuminance was increased to 0.935 kmc. There was no significant difference in the proportion of subjects detecting flashes where flash distribution was the independent variable. A greater proportion of flashes was seen under the distributed condition than under the massed condition. More subjects made detections when the stimulus was 0.935 kmc than when it was 0.13 kmc. Author

N68-34529*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

LANGLEY RESEARCH CENTER SIMULATORS AND STUDIES RELATED TO SPACE RENDEZVOUS AND DOCKING

Jack E. Pennington *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 31–39 refs (See N68-34525 21-05)
CSCL 05H

Summarized are research efforts resulting in the development of visual rendezvous simulators, rendezvous docking simulators (RDS), and visual docking simulators (VDS) for improving pilot capabilities, minimizing system requirements, and increasing the probability of mission success during Gemini-Agena and future Apollo spacecraft maneuvers. Visual rendezvous simulators were used in studies of the acquisition phase of visual rendezvous, and coplanar rendezvous closure control. Studies made using the VDS included the effects of control modes (direct command and rate command) on the pilot's control of docking, and docking problems arising from target lighting under daytime and nighttime lighting conditions. Studies of visual-aid techniques that could be added to the Gemini-Agena without major modifications, reduce inaccuracies, and increase pilot's confidence, particularly in the darkside (night) docking were made using both the VDS and the RDS. The RDS was also used to evaluate the suitability of the Agena Target Docking Adapter (TDA), and the effect of thruster failure on the pilot's control of docking. Other studies made with the simulators included: a technique for manually determining range and range rate during rendezvous; evaluations of Gemini cockpit instruments and controllers; techniques for reducing control cross-coupling by canting the translation jets; and remote controlled docking using closed circuit television. S.C.W.

N68-34530# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SOME LANGLEY RESEARCH CENTER PLANS IN THE AREA OF VISUAL DISPLAYS FOR LUNAR MISSION SIMULATION

Donald R. Riley and Byron M. Jaquet *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 40–51 (See N68-34525 21-05) refs

Simple guidance techniques for pilot control of various tasks associated with the lunar mission are examined using analytical and simulation approaches. These simplified techniques and pilot utilization are directed towards increasing the reliability of Project Apollo and other manned space missions. Results of simulator studies have shown that, given proper information, pilots can perform rendezvous and docking, although these missions have not actually been performed in space. The usefulness of simulator devices, however, has been demonstrated in Project Mercury. Simulation devices such as LOLA (Lunar Orbit and Landing Approach) and the Lunar Landing Research Facility will provide information necessary for the lunar and other space programs. Author

N68-34531*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

VISUAL MASKING USING DIFFERENT TEST STIMULUS PATTERNS

Robert C. Boyle *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 52–61 refs (See N68-34525 21-05) CSCL 05H

A visual masking experiment is described which was designed to demonstrate the relationship between human visual perceptual latency and object luminance during high velocity flight. In this study the term visual masking refers to the gradual reduction of correct responses as to the orientation of a patterned test stimulus as the temporal interval between the test stimulus and a succeeding brighter masking stimulus is decreased. A latency model of visual masking is used to explain obtained results. The thesis of the experiment is that even though the constants of an equation based on a latency model of visual masking may vary some with different test-stimulus patterns, the variation, despite its significance, will be relatively minor and the equation will retain its general latency form. Studied were three subjects, Naval personnel, who were trained on three test stimuli over a two-week period. Throughout the experiment each subject used only the right eye. Subjects were tested using a test-stimulus positioning servo system. Stimuli consisted of three equal area stimuli, a blanking flash stimulus, and a fixation pattern. Each subject's task was to identify the position (up, down, left, or right) of the test stimulus. Preliminary data show that visual masking decreases as test flash luminance is increased or as the interval between the test flashes and blanking flashes is increased. It is concluded that observed visual latencies could have important ramifications for the operation of very high velocity spacecraft, and that in view of these findings traditional concepts of pilot observation of the external environment should be modified. S.C.W.

N68-34532*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SEXTANT SIGHTING PERFORMANCE IN THE AMES MIDCOURSE NAVIGATION AND GUIDANCE SIMULATOR

Robert J. Randle and Bedford A. Lampkin *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 62–70 refs (See N68-34525 21-05) CSCL 05H

Described is a lunar midcourse navigation and guidance simulator which is being used to study the role of the crew in spacecraft navigation, guidance, and control during translunar or midcourse flight. Major features of the simulator and results of an exploratory study of sextant (hand-held and gimbal mounted) sighting performance of three Air Force navigator instructors in a simulated task environment (celestial visual scene) are reviewed to demonstrate the capabilities of the simulator as a research device for visual problems. S.C.W.

N68-34533# California Univ., San Diego. Scripps Inst. of Oceanography.

COMMENTS ON MAJOR GORDON COOPER'S OBSERVATIONS FROM ORBIT

John H. Taylor *In* NAS-NRC vision res.: Flying and Space Travel 1968 p 71–79 (See N68-34525 21-05)

The Mercury series of manned earth-orbital space flights ended with the mission referred to as MA-9, piloted by Major L. Gordon Cooper. During certain of the 22 orbits, Major Cooper reported having seen objects on the surface of the earth that must necessarily have subtended very small visual angles from the capsule. In view of the immediate and vociferous reaction on the part of the scientific and lay communities as to the validity of Major Cooper's sightings, a controlled experiment was conducted to assess the ability of the Gemini astronauts to discriminate ground features. This ex post facto visibility problem was examined as follows: (1) four specific reported sightings (El Centro and El Paso California, the high Tibetan plateau, and western China) were studied which combined atmospheric transmission data, known visual performance capabilities, and both measured and assumed properties of the objects purportedly seen; and (2) for each of the four cases investigated, pertinent excerpts are given from Major Cooper's statements. On the basis of these studies it is concluded that: (1) the terrestrial objects reported by Major Cooper from the Faith 7 capsule could have been seen under the conditions that have been assumed to have prevailed during the MA-9 mission; and (2) the fact that Major Cooper is a superior observer and highly experienced in high altitude observation indicates that extimates of the performance of an observer in a real life situation that are based on laboratory data may be conservative. S.C.W.

N68-34534# California Univ., San Diego. Scripps Inst. of Oceanography.

GEMINI IN-FLIGHT VISUAL-ACUITY EXPERIMENT

S. Q. Duntley *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 80–82 (See N68-34525 21-05)

The design of a controlled experiment which will test existing methods of predicting the visual capabilities of human observers in space is reported. The experiment is designed (1) to determine under carefully documented conditions the effects of prolonged weightlessness, 5 PSI oxygen breathing, and other environmental conditions peculiar to space flight on the astronaut's visual performance capabilities as a function of time; (2) to obtain information by measurements prior to flight on the visual capabilities of the astronauts who will be involved in the seven day or longer missions; and (3) to measure (in flight) astronaut performance in two visual tasks. The astronauts involved in missions GT-5 and GT-6, and/or GT-7 will be required to measure their own visual acuity during the mission with the aid of an in-flight vision tester. The task will involve the use of the tester by each man once a day throughout the flight. The in-flight vision tester will be completely self-contained and require no interfaces with the spacecraft other than stowage. In addition, during orbits which pass within range of a prepared ground target area, the astronaut in the right hand seat will determine the orientation of each of approximately 12 rectangular targets. The astronaut will make a binary-type decision which will be recorded on a card. The card which is removable will contain the results of the vision tests which will be read by the astronaut either into his tape recorder or directly by radio link to the ground. S.C.W.

N68-34535# Bureau of Medicine and Surgery, Washington, D. C.

OPERATIONAL SIGNIFICANCE OF THE FLASH BLINDNESS PROBLEM

Walton L. Jones *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 85–94 (See N68-34525 21-05)

The operational significance of flash blindness is discussed in view of its effects on performance capabilities of Navy aviation personnel engaged in activities for which the maintenance of effective vision is critical, i.e., low level daylight attack, night formation flights, and carrier night deck operations. It is shown that as the problem of flash blindness is placed into operational perspective, in certain respects it poses a more serious problem than those produced by the blast, shock, and thermal radiations from nuclear weapons. Major efforts of a Navy program focusing on protective devices and procedures for minimizing the hazards of flash blindness phenomena are reviewed. Program efforts include: (1) laboratory investigations of visual impairment from exposure to high intensity light sources; (2) collection of data for a model allowing prediction of flash blindness hazard in operational environments; (3) development and evaluation of flash blindness protection devices; and (4) preparation of training and indoctrination materials for pilots. S.C.W.

N68-34536# Naval Air Development Center, Johnsville, Pa. Aviation Medical Accelerator Lab.

THE NATURE OF RADIATION FROM NUCLEAR WEAPONS IN RELATION TO FLASH BLINDNESS

J. H. Hill and Gloria T. Chisum *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 95–103 refs (See N68-34525 21-05)

The rate of emission of thermal radiation from a nuclear weapon detonated at low altitude is evaluated in an attempt to provide information on the nature of radiation in relation to flash blindness; and to provide guidelines for the design of adequate flash blindness protective devices consisting of the luminance, duration, and visual angle subtended by the source. It is assumed that, except for their eyes, personnel can be adequately protected up to the point at which they would receive second degree burns. On the basis of this assumption, the concept of equal effects of nuclear weapons regardless of weapon size is used to estimate fireball luminances for five weapon yields. Using these estimates, predictions are made of factors as: (1) the integrated luminances which would be received by the eyes, protected only by the blink reflex, and by some of the protection devices under development; (2) the extent of the retina covered by the image of a fireball; and (3) the effect of fireball luminance on other surfaces within the visual field in the event that the fireball itself is not imaged in the retina. It is shown that the integrated luminance received from a surface with 10% diffused reflectance can be over 5 log mL-sec if no protective measures but the blink reflex are used; and (2) this luminance is sufficient to cause flash blindness hazardous to a pilot. Qualitative comparisons are made of rates of arrival of thermal radiation at a given distance from high altitude and sea level bursts. S.C.W.

N68-34537# Pennsylvania Univ., Philadelphia. School of Medicine.

EXPERIMENTAL INVESTIGATIONS OF THE FLASH BLINDNESS PROBLEM

John Lott Brown *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 104–126 refs (See N68-34525 21-05)

Laboratory studies of flash blindness parameters which attempt to define how vision is impaired by exposure to unusually high

energy levels in spectral and temporal patterns that are representative of those to be encountered from atomic weapons; are reviewed. Specifically considered are those parameters of paramount importance to the pilot of high performance aircraft, such as luminance and visual-acuity requirements. Examined are studies of the relation between the energy of blinding flash and the time required for detection of information in a visual display; the relation between luminance and recovery time; the distribution of adapting-flash energy in time and its effect on visual threshold; photochemical aspects of light adaptation; and spectral characteristics of flash and task illumination. Studies of additional variables that are of importance to understanding flash blindness phenomena as pupil size, differences in results (high variability) from one subject to another, and masking effects of the afterimage of the adapting flash; are also cited. Included is a review of quantitative formulations developed to study flash blindness effects. S.C.W.

N68-34538# Edgerton, Germeshausen and Grier, Inc., Boston, Mass.
METHODS OF PREVENTING FLASH BLINDNESS
Frederick E. Barstow *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 127–133 See N68-34525 21-05)

Discussed are nominal specifications of flash blindness protective devices; active (mechanical, polarization, and chemical-molecular) and passive (blink response, eye patch, and fixed filter) flash blindness protection methods; and advantages and limitations of a more specific method, the photochromic protective system, which is an indirectly actuated system requiring ultraviolet energy from flash tubes. S.C.W.

N68-34539# School of Aerospace Medicine, Brooks AFB, Tex. Ophthalmology Dept.
AIR FORCE EFFORTS IN THE FIELD OF FLASH BLINDNESS
James F. Culver *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 134–139 refs (See N68-34525 21-05)

Presented is a short summary and reference list of Air Force activities focusing on the development of systems and devices for protecting the eyes of flying personnel from thermonuclear induced hazards as flash blindness and chorioretinal burns. Cited are studies of the feasibility of using a fixed-filter eye protection system; design criteria for eye protection from nuclear flashes and prototype eye protective devices; and in-house studies of flash blindness which are designed to define the operational aspects of this problem and outline a training program. Areas under continuing development include: (1) phototropic, or so-called self-attenuating, filters which darken on exposure to ultraviolet and shortwave-length visible radiation; (2) indirectly activated phototropic filters activated by flash tubes; (3) dynacell phototropic filters which consist of highly sensitive phototropic fluids flowing through filter cells; and (4) electronic triggering systems for the indirectly activated filters. S.C.W.

N68-34540# Biotechnology, Inc., Arlington, Va.
A FLASH BLINDNESS INDOCTRINATION AND TRAINING DEVICE
James F. Parker, Jr. *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 140–142 (See N68-34525 21-05)

Described is a flash blindness indoctrination and training device which was developed to demonstrate to pilots who might operate in nuclear combat zones what would happen to their vision, and consequently, to their mission capability if they unexpectedly encountered the light from a nuclear burst. The device will serve the following two training functions: (1) indoctrination training, and (2) proficiency training. Basic elements of the flash blindness device are: flasher unit, focusing hemisphere; diffuser screen; pilot's instrument panel; and operator's panel. An important use of the device is to illustrate the dramatic decrease in visual recovery time which occurs when the illumination of the visual task is increased. Results of tests of several subjects in the proposed device are cited. Tabulated are the range of recovery times for two conditions of illumination of the visual task which consisted of reading three digits which were white against a black background, as soon as possible following the flash. S.C.W.

N68-34541# Human Factors Research, Inc., Los Angeles.
GEOGRAPHIC ORIENTATION DURING LOW-ALTITUDE FLIGHT
James J. McGarth *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 146–163 ref (See N68-34525 21-05)
(Contract Nonr-4218(00))

Summarized are results of a problem analysis effort which was designed to determine the need for geographic orientation research and the directions such research should take. Geographical orientation is defined as the pilot's awareness of his navigational position; however, studies are limited to those missions in which the pilot must fly at low altitudes under visual flight rules. Purposes of the research were: (1) to determine whether pilots under operational conditions become lost frequently enough to constitute a significant cause of mission failure; (2) to determine the role of human performance research in the study of geographical orientation and to establish the priority of research problems within this area; and (3) to evaluate possible experimental techniques to be used in solving the research problems. Results of these studies indicate that: (1) geographic disorientation does occur frequently enough in present-day aviation operations to affect significantly the success of these operations; (2) problem areas which make significant contributions to geographic disorientation are visual reference, dead reckoning procedures; aeronautical charts (selection and encoding of information); weather conditions; preflight procedures; and flight instruments; (3) checkpoint detection and identification play a key role in geographic orientation; and (4) techniques which provide either visual stimuli which are comparable to the visual conditions in the real world situation and/or methods which allow the pilot some form of mobility, as for example motion picture techniques, offer complementary methodological approaches to studies of geographic disorientation. S.C.W.

N68-34542# Autonetics, Downey, Calif.
DYNAMIC VISUAL DETECTION RECOGNITION
Charles P. Greening *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 164–175 refs (See N68-34525 21-05)

A schema for relating complex dynamic properties of the visual system to other aspects of visual research is described; dynamic properties of the low altitude visual field (i.e., single-point geometry and extended-object geometry) are examined; and results of laboratory and flight test studies of dynamic target detection and recognition performance are reviewed. S.C.W.

N68-34543# Army Aeromedical Research Unit, Fort Rucker, Ala.
OPERATIONAL PROBLEMS ASSOCIATED WITH LOW-ALTITUDE FLIGHT
Robert W. Bailey *In* NAS-NRC Vision Res.: Flying and Space Travel 1968 p 176–179 refs (See N68-34525 21-05)

Discussed are operational problems associated with low altitude flight in Army aviation, more specifically, nap-of-the-earth flying which is conducted in close proximity to the earth as a protective measure against enemy observation and weapons. Focused on are visual navigation problems which are directly related to apparent speed and effective line-of-sight distance. Other problem areas associated with flying nap-of-the-earth include: (1) the definite decrease in security and resultant increase in stress on the pilot due to his relative air-ground position; (2) differences in complexity of the task of flying low profiles between helicopter pilots and fixed wing pilots; and (3) visual streaming effects (at very low altitudes,

e.g., 30 ft on flat terrain) which produce nausea in pilots flying at 250 knots. Included are results of two studies performed during extended low altitude flight which are pertinent to the human engineering deficit and the problem of navigation over unfamiliar terrain during flights flown nap-of-the-earth. S.C.W.

N68-34544# *Air Proving Ground Center, Eglin AFB, Fla.*
SOME OPERATIONAL ASPECTS OF VISUAL PROBLEMS IN LOW-FLYING, HIGH-SPEED AIRCRAFT
Robert L. Jones and James S. Joska *In* NAS-NRC Vision Res.: *Flying and Space Travel* 1968 p 180–197 refs (See N68-34525 21-05)

Inherent operational problems contained in the close-support and interdiction type missions into enemy territory which are associated with the use of low flying, high speed aircraft are discussed. Problems considered include navigation to the target area, search for the target, target acquisition, target recognition, tactical maneuvering, weapons delivery, and escape. Focused on are human factors aspects for both reciprocating-engine and jet aircraft pilots involved in achieving a first pass acquisition, recognition, and fire situation where the pilot might acquire, recognize, and destroy a target on a single pass; and results of flight tests which were designed to obtain data relating to the distance at which typical ground targets might be acquired and recognized during high speed, low altitude flight. The F-100 aircraft was used with 500 ft as the test altitude, and acquisition distances were obtained for speeds of 250, 350, 450, and 550 knots. Data on the relationship between airspeed and target acquisition distance, and run number and target acquisition distance are presented. Also reported is the initiation of another test to evaluate training techniques to improve the perceptual efficiency of pilots, and thus improve their capability for target acquisition and recognition. The techniques under evaluation involve use of linearly programmed photographs (ranging from low stimulus ambiguity to high stimulus ambiguity) of typical tactical targets which will be presented on a tachistiscopic teaching machine, allowing stimulus presentation speeds of 1 sec, 1/2 sec/ 1/10 sec, and 1/20 sec. S.C.W.

N68-34548*# Philco-Ford Corp., Palo Alto, Calif. Western Development Labs.
PHYSIOLOGICAL MONITORING TECHNIQUE USING UNATTACHED SENSORS
Mylen Fitzwater, dePaul Corkhill, Earl Jackson, Paul Halvorson, and Werner Sepper Mar. 1968 97 p refs
(Contract NAS12-121)
(NASA-CR-86048) CFSTI: HC $3.00/MF $0.65 CSCL 06B

As crews of future extended space missions will work in a shirt sleeve environment, research was undertaken to develop techniques and electronic instrumentation for electrocardiographic and body impedance change measurements without attaching or implanting sensors or electrodes. The physiological measurements made included heart biopotential waveforms obtained from electrodes placed on each arm; impedance respiration measured from palm to palm; impedance pulse measured from palm to palm; thoracic sounds picked up by a microphone placed in the mid-dorsal position; and galvanic skin response measured by impressing a direct current from palm to palm. The monitoring system consists of two palmar dry electrodes and a microphone as sensors; a set of solid-state modular signal conditioners designed to separate, filter, and amplify each channel of physiological information; and a strip chart recorder. Results obtained using palm-to-palm dry unattached electrodes were found to be comparable to those obtained using conventional methods, although further circuit design changes are planned. M.G.J.

N68-34549*# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.
COMPUTERIZED INSTRUCTION AND THE LEARNING PROCESS
Richard C. Atkinson 15 Sep. 1967 33 p refs Presented at meetings of the Am. Psychological Assoc., Washington, D. C., Sep. 1967
(Grant NGR-05-020-244)
(NASA-CR-96546; TR-122) CFSTI: HC $3.00/MF $0.65 CSCL 05J

The operating experience encountered in a computer-assisted instruction (CAI) reading program is reviewed. The data are based on working with a sizable group of first-grade children who received a major portion of their daily reading instruction under computer control. A tutorial approach was used as such programs have the capability for real-time decision making and instructional branching contingent on a single response or on some subset of the student's response history. Details are given on the development of the IBM-1500 instructional system which consists basically of a central process computer with accompanying disc-storage units, proctor stations, and an interphase to 16 student terminals. The CAI reading curriculum is discussed, along with the problems involved in developing the Coursewriter 2 computer language. Tables are included to show the audio messages and film pictures required for two sample problems along with the hypothetical addresses on the audio tape and film strip; and the computer commands required to present two examples of these problems, analyze the student's responses, and record his data record. M.G.J.

N68-34575# Federal Aviation Administration, Washington, D. C. Office of Aviation Medicine.
A RETROSPECTIVE ANALYSIS OF AEROMEDICAL CERTIFICATION DENIAL ACTIONS, JANUARY 1961–DECEMBER 1967
P. V. Siegel and Charles F. Booze, Jr. May 1968 12 p refs
(AM-68-9)

The study quantifies several unknowns and/or uncertainties with respect to medical and general descriptive attributes of airmen denied medical certification. Data are presented concerning age, sex, occupation, total flying time, and medical characteristics of denied airmen. Certification actions at the appellate level are discussed to include medical problems associated with appeals to the Federal Air Surgeon and the FAA Administrator. An analysis of mortality experience among airmen exempted from the regulations due to cardiovascular problems is also presented. Author

N68-34576*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MICROBIOLOGICAL STUDIES ON LIFE SUPPORT SUBSYSTEMS FOR MANNED SPACE FLIGHT
Judd R. Wilkins [1968] 19 p refs Presented at the Am. Ind. Hyg. Assoc., St. Louis, 13–17 May 1968
(NASA-TM-X-61209) CFSTI: HC $3.00/MF $0.65 CSCL 06K

A research test chamber to study and test critical life support subsystems for long duration space missions is investigated. This system is designed to support four men for 90 days without resupply. Critical life support subsystems include the recovery of water from urine, waste management, and personal hygiene. Microbiological studies in support of the development and testing of these subsystems are reported. Emphasis is placed on the microbiological problems associated with the recovery of water from urine using a wick evaporator system. Such factors as system sterilization, antimicrobial treatment procedures, and laboratory methodology to meet biological standards are discussed. Laboratory investigations associated with other life support subsystems are also presented. Microbiological results obtained during closed-door testing of the integrated life support system test chamber are reviewed. Author

N68-34582*# Stanford Univ., Calif. Aeronautics and Astronautics Dept.
TRANSMISSION CHARACTERISTICS OF AXIAL WAVES IN BLOOD VESSELS

M. Anliker, W. E. Moritz, and E. Ogden (NASA. Ames Res. Center) Apr. 1968 38 p refs Presented at the SESA Spring Meeting, Albany, 7–10 May 1968
(Grant NGR-05-020-223)
(NASA-CR-96766; SUDAAR-343; SESA Paper-1350) CFSTI: HC $3.00/MF $0.65 CSCL 06P

For a thorough evaluation of the mathematical models used in the analysis of the behavior of blood vessels it is necessary to measure also the dispersion and attenuation of the axial and circumferential (torsion) waves. To this end a method has been developed to determine the phase velocities and damping of sinusoidal axial waves in the carotid artery of anesthetized dogs with the aid of an electro-optical tracking system. For frequencies between 25 and 150 Hz the speed of the axial waves was between 20 and 40 m/sec and generally increased with frequency, while the natural pressure wave travelled at a speed of about 10 m/sec. On the basis of an isotropic wall model the axial wave speed should, however, be approximately 5 times higher than the pressure wave speed. This discrepancy can be interpreted as an indication for an anisotropic behavior of the carotid wall. The carotid artery appears to be more elastic in the axial than in the circumferential direction. Author

N68-34619# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CHANGES IN THE WORK CAPACITY OF HUMAN MUSCLE AFTER EXPOSURE TO HYPOKINETIC CONDITIONS [IZMENENIE MYSHECHNOIRABOTOSPOSOBNOSTI POSLE PREBYVANIYA CHELOVEKA V USLOVIYAKH GIPOKINEZII]
N. I. Taranov and N. E. Panferova 24 Jan. 1968 9 p refs Transl. into ENGLISH from Fizol. Zh. (USSR), v. 51, no. 11, 1965 p 1351–1355
(FTD-HT-23-36-68; AD-672337)

The limitation of muscular activity that can occur during spaceflight impairs the functional state of the motor apparatus. The functional shifts in the muscular apparatus during dynamic work are characterized by more rapid fatigue. The quality of dynamic work decreases after man is exposed to limited muscular activity. The decrease is characterized by a decrease in the force of muscular contractions and a disturbance in the rhythmicity of the work. The bioelectric activity of working muscles increased by 1.5-2 times after a 1-3 day exposure to limited muscular activity. After a more prolonged exposure of man to muscular inactivity the bioelectric activity of the working muscles was reduced in comparison with control tests before the start of the experiment. Author (TAB)

N68-34625# Joint Publications Research Service, New York.
ORGANIZATION AND SIMULATION OF AN ACOUSTIC ANALYZER
V. A. Dolyatovskiy 23 Aug. 1968 14 p refs Transl. into ENGLISH from Modelirovaniye v Biol. i Med. (Kiev), v. 2, 1966 p 72–84
(JPRS-46275) CFSTI: HC $3.00/MF $0.65

Methods are presented for organizing and simulating an acoustic analyzer, which represents a complex information system consisting of three sections and having four successive neuronal switchings at different levels. The tympanic membrane represents the first section, or the receptor; the conducting section consists of hair cells and the first neuron; and cortical section is the third part of the analyzer. The cochlei nuclei contain the second neuron and approximately 90,000 cells with about 60 connections in each. Characteristics are noted for the corpus geniculatum mediale, containing the third neuron, and the corpora quadrigemina. On the basis of the organization postulated for these sections, a simplified model, proposed for processing information by the auditory system has the form of an electronic discriminating device. M.W.R.

N68-34630# Naval Submarine Medical Center, Groton, Conn. Submarine Medical Research Lab.
CARBON DIOXIDE RETENTION DURING PROLONGED EXPOSURE TO HIGH PRESSURE ENVIRONMENT Interim Report
Karl E. Schaefer, George F. Bond, Walter F. Mazzone, Charles R. Carey, and James H. Dougherty Apr. 1968 19 p refs
(SMRL-520; AD-672554)

In preparation for the SEALAB II project, three subjects were exposed for twelve days to seven atmosphere of pressure in an artificial environment composed of helium, oxygen, and nitrogen. Average ambient CO2 concentration was 17% surface equivalent. Resting respiratory minute volume was increased to twice normal and related to a proportional increase in tidal volume. Both oxygen consumption and CO2 excretion were elevated, resulting in a respiratory exchange ratio of 1.02. Alveolar CO2 and mixed expired CO2 were significantly higher during the exposure period. Urine CO2 excretion was markedly increased from the second day on throughout the exposure. Potassium, sodium and chloride excretion showed a transitory increase during the first four days. The pattern of urinary CO2 and electrolyte excretion reflected a response to higher CO2 load than that present in the atmosphere of the chamber during the test. All values returned to initial levels during the 27 1/2 hour decompression period. The observed CO2 retention is explained as the summation of increased respiratory work indicated in the 38% reduction in maximum breathing capacity, accumulated CO2 in the chamber atmosphere, and respiratory pattern of trained divers serving as subjects. In regard to the increased CO2 production, an additional factor of possible metabolic alterations is suggested. A stress response was indicated in the increased blood corticosterone levels and elevated excretion of ketosteroids. The PO2 level of 200 mm Hg did not produce any change in hemoglobin or hematocrit. Author (TAB)

N68-34656# Defence Research Medical Labs., Toronto (Ontario).
THEORETICAL ASPECTS OF THE ROLE OF ANGULAR ACCELERATION IN VESTIBULAR STIMULATION
R. S. Weaver [1968] 38 p
(RP-565)

Various types of acceleration are systematically considered, and it is shown that turntable accelerations generally consist of several components, each readily calculable. The equations of motion are applied to the human vestibular apparatus when undergoing acceleration. Turntable experiments and the physical effects of the associated motions are analyzed, with emphasis on the forces experienced by the semicircular canals. The applicable vector algebra is developed, and equations of motion are derived in vector form. Graphs and a nomograph are presented for evaluating the results of centrifugal acceleration. K.W.

N68-34665*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INSTANT MODULAR 3D MOCKUP FOR CONFIGURING CONTROL AND DISPLAY EQUIPMENT
Charles C. Kubokawa May 1968 30 p refs Presented at the IEEE 9th Ann. Symp. on Human Factors in Electron., Washington, D. C., 6–7 May 1968
(NASA-TM-X-61196) CFSTI: HC $3.00/MF $0.65 CSCL 05E

The modular three-dimensional mockup technique is demonstrated to be the middleground between the user and the designer of the equipment. The mockup method helps the designer to see easily, without operational knowledge, what the operator is trying to convey. The method described is (1) an effective and necessary communication link between user and designer in equipment design; (2) versatile in application; (3) flexible in configuration and design; (4) economical in cost; and (5) a time saver in design development. Suggestions for use include: aircraft instrumentation panels, computer control consoles, home appliance control panel, radio–radar equipment. Author

N68-34666*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

BLOOD CHANGES IN ACUTELY SPLENECTOMIZED RATS DURING PROLONGED HYPEROXIC EXPOSURE

H. A. Leon, G. A. Brooksby, M. J. Chackerian, and R. W. Staley May 1968 2 p refs Presented at the 39th Ann. Sci. Meeting of the Aerospace Med. Assoc., Bal Harbour, Fla., 6–9 May 1968

(NASA-TM-X-61195) CFSTI: HC$3.00/MF$0.65 CSCL 06C

Preliminary experiments to show the effect of oxygen on circulating red blood cells in splenectomized male rats were conducted. Exposing these rats to oxygen at pressures from 600 to 258 mm Hg consistently changes hematocrit, total hemoglobin, and osmotic fragilities of red blood cells, indicating that the circulating red cell mass was decreased by an active removal of the older or more fragile cells. These changes were observed within three days. Methemoglobin and serum bilirubin show no deviation from those of the control rats. Osmotic fragility was determined in saline concentrations from 0.2% which caused 100% hemolysis, to 0.55% where lysis was negligible. The greatest decreases in fragility occurred in the higher saline concentrations. B.P.

N68-34674*# Serendipity Associates, McLean, Va.

THE PROBLEM OF OFF DUTY TIME IN LONG DURATION SPACE MISSIONS, VOLUME 2 Final Report

John W. Eberhard Oct. 1967 104 p refs

(Contract NASw-1615)

(NASA-CR-96721; TR-55-67-14(U), V. 2) CFSTI: HC $3.00/MF $0.65 CSCL 05E

This study analyzes the available off duty time in long duration space missions and suggests ways to use it. The time allocated for off duty, sleep, work and contingencies in representative mission studies was evaluated relative to the best current estimates of time required for these activities. The evaluation showed that there was too little scheduled off duty time, yet there was an excessive amount of off duty time available during the deep space phases of the mission. Discretionary activity possibilities during off duty time for the mission were determined. A detailed analysis was performed of activity possibilities for long duration missions and of actual activities employed by both general and special populations. The best source of activity requirements was the activity regimes of isolated groups such as the scientist and Navy personnel during the wintering over period in the Antarctic. Finally, suggestions are made for handling the excessive off duty time and guidelines were developed related to the off duty time period and to the design of discretionary activities. Author

N68-34679# George Washington Univ., Alexandria, Va. Human Resources Research Office.

REVIEW OF CONCEPTS AND LITERATURE ON CONTINGENCY MANAGEMENT

Barrie Cassileth Jun. 1968 16 p refs *Its* Humrro Profess. Paper 15–68

(Contract DA-44-188-ARO(D)-2)

(AD-672484)

The paper reviews theoretical background and recent developments in contingency management. The contingency management approach applies psychological principles of reinforcement (reward) in attempting to manage behavior (or learning) by manipulating the immediate effects, or contingencies, occurring as a consequence of performance. A survey of related literature includes studies with the retarded, with deviant behavior, and with children. Author (TAB)

N68-34711# Army Biological Labs., Fort Detrick, Md.

THE USE OF DARK-FIELD ILLUMINATION IN THE ELECTRON MICROSCOPE FOR MICROORGANISM STRUCTURE STUDY

G. P. Petrova and K. A. Ponomarev Jul. 1968 6 p refs Transl. into ENGLISH from Mikrobiologiya (Moscow), v. 28, no. 5, 1959 p 777–782

(TRANS-440; AD-672105)

With the assistance of the accessories that were installed in the electron microscope EM-3 it is possible to receive a dark-field illumination of a given area of an object and to change it to a bright field of the same area in short period of time. The dark-field method in electron microscopy is perspective for investigation of the internal structures of bacterial cells. In the dark field the difference in the character of the electron diffusion by the bodies of the gram-positive and gram-negative bacteria is clearly shown. It is expressed in that the gram-positive and gram-negative forms appear dark in the bright field, whereas in the dark field the gram-positive forms are dark and the gram-negative bright. A combination of the methods of investigating an object in the dark and bright field gives a more complete representation of the objects structure than either of them can give separately. Author (TAB)

N68-34751*# Serendipity Associates, McLean, Va.

THE PROBLEM OF OFF DUTY TIME IN LONG DURATION SPACE MISSIONS. VOLUME 3: AN ANNOTATED BIBLIOGRAPHY

John W. Eberhard and Kristine T. Smith Oct. 1967 202 p

(Contract NASw-1615)

(NASA-CR-96737; TR-55-67-15(U), V. 3) CFSTI: HC $3.00/MF $0.65 CSCL 05E

The bibliographic listings pertain to publications on the effects of off-duty time on special isolated groups and on the individual, mission requirements, sleep requirements, work opportunities, and possible and probable activities for off-duty time periods. The citations are arranged according to intact group studies classified as Antarctic, underwater, remote sites, and space flight; and studies and reviews relating to mission requirements, space flight factors, space simulations, sleep and work–rest cycles, leisure, laboratory, and small group factors. M.G.J.

N68-34773*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EXTRATERRESTRIAL BIOLOGY: PROSPECTS AND PROBLEMS

Harold P. Klein [1968] 42 p refs Presented at the 4th Intern. Symp. on Bioastronautics and Exploration of Space, San Antonio, 24–27 Jun. 1968

(NASA-TM-X-61191) CFSTI: HC$3.00/MF$0.65 CSCL 06C

Two general arguments are presented to support the view that extraterrestrial life is widely distributed in the universe: (1) Life evolves from simple precursors when conditions on a planet favor the condensation of these materials to more complex substances. (2) Among the enormous number of stars in the universe, planetary systems and planets with suitable environmental characteristics will appear. As distance may restrict space travel to the solar system, the possibilities of finding life on these planets are assessed, with Mars considered as the best available target for conducting the search. The adaptation of organisms to environmental conditions is discussed, along with microorganism growth under simulated Martian conditions. Problems in planning life detection experiments are pointed out, and approaches to these problems are proposed. The scientific motivations and the interest of biologists in the search for extraterrestrial life are expressed. M.G.J.

N68-34779*# Houston Univ., Tex.

EXPERIMENTS AND OPERATIONAL PROCEDURES FOR DEVELOPING GERM-FREE SEEDS, SEEDLINGS, PLANTS, TISSUES AND CELL LINES FOR THE LUNAR RECEIVING LABORATORY Final Report

S. Venketeswaren 31 Aug. 1968 43 p refs
(Contract NAS9-6822)
(NASA-CR-92258) CFSTI: HC$3.00/MF$0.65 CSCL 06C

Botanical systems developed for the Lunar Receiving Laboratory (LRL) included 5 algae and 12 vascular plants; and analyses were made of algal growth, seed germination, seedling development, and establishment and maintenance of tissue cultures of the vascular plants. Blue-green, green, and red alga are currently being maintained as germ-free cultures in either solid agar media or in liquid cultures. Callus tissue of many of the higher vascular plants were established, and histological analysis of some of these tissues was performed. A strain of corn tissue derived from the lateral roots axis maintained a diploid condition, and electron microscope observations revealed a parietal layer of cytoplasm with normal structure of nucleus and other organelles. There were numerous double-membered organelles containing darkly stained storage products of possible starch or lipid composition. Details of the cultures are included for all the systems. M.W.R.

N68-34802*# Institute of Modern Languages, Inc., Washington, D. C.
PULMONARY SCINTIGRAPHY IN LUNG EDEMA [LUNGENSZINTIGRAPHIE BEI LUNGENEMBOLIE]
H. Rossler NASA Aug. 1968 3 p ref Transl. into ENGLISH from Schweiz. Med. Wochschr. (Basel), v. 98, no. 23, 1968 873 p
(Contract NASw-1693)
(NASA-TT-F-11902) CFSTI: HC$3.00/MF$0.65 CSCL 06E

Presented is an assessment of two pulmonary scintigraphic techniques used in diagnostic examinations of patients suspected of having lung edema. The two methods evaluated were (1) inhalation scintigrams, and (2) vascular or perfusion scintigrams. Both methods were simultaneously applied during a study involving 73 patients of the Baylor University College of Medicine and of the Ben Taub General Hospital in Houston, Texas. On the basis of these studies it is concluded that scintigraphic findings are adequately safe for instituting anti-coagulation therapy, or for a ligature of the V. cava; however, a pulmonary embolectomy should not be undertaken without positive evidence of embolism in the angiorgram, which can, if necessary, be obtained during the operations. S.C.W.

N68-34809 Federal Aviation Agency, Oklahoma City, Okla. Office of Aviation Medicine.
THE EFFECTS OF BODY THERMAL STATE ON MANUAL PERFORMANCE
J. A. Vaughan, E. A. Higgins, G. E. Funkhouser, and Elinore M. Galerston May 1968 12 p refs
(AM-68-13)

Thirty-six young men were exposed for 2 hours to environmental temperatures of 10°, 26.7°, or 46° C. Measurements of rectal and skin temperature, heart rate and respiratory rate were made, and average skin and average body temperatures were calculated. Manual performance consisted of standardized peg tests for hand and finger dexterity, and a written motor coordination test. Converted scores showed no significant differences in peg placing at any of the thermal states studied. Men exposed to the neutral environment scored highest in the finger dexterity tests, but values for motor coordination were greater in the heat than in the other two environments. These data suggest that coarse hand movements are independent of body thermal state, but that more discrete tasks involving hand and finger dexterity, and motor coordination, can be most efficiently performed in warmer environments which promote at least thermally neutral values of skin and deep body temperature. Author

N68-34881*# McDonnell-Douglas Co., Newport Beach, Calif. Astropower Lab.
SPACE CABIN ATMOSPHERE CONTAMINANT DETECTION TECHNIQUES
Norman R. Byrd Jul. 1968 192 p refs
(Contract NAS12-15)
(NASA-CR-86047; SM-48446-F) CFSTI: HC $3.00/MF$0.65 CSCL 06K

The objectives of this work were: (1) to obtain semiconducting polymers having maximum unsaturation and having film-forming capability; (2) to prepare sensors with candidate polymers; (3) to evaluate sensor preparation and response characteristics to various contaminants; and (4) to analyze a multiple sensor for space cabin use. A literature search was made which covered the use of adsorption methods, mass spectrometry, spectrophotometry, electronic systems, and other gas detection techniques. The preparation and derivatives of poly (phenylacetylene) for use in the sensors are described. The electrical properties of the polymers were investigated, including the effect of structure and morphology on the electrical characteristics, the electrical response of organic semiconductors, and charge transfer complexes. Gas-polymer interactions and response characteristics were measured with finger electrode and lock-and-key electrode geometries. The effectiveness of combination organic-inorganic devices was studied. A prototype portable two-sensor gas detector is briefly described which uses poly (p-nitrophenylacetylene) and poly (p-aminophenylacetylene) as the sensing polymers, cast as thin films on the lock-and-key electrode geometry. K.W.

N68-34894# Bureau of Mines, Pittsburgh, Pa.
LOW-TEMPERATURE PERFORMANCE OF COMPRESSED-OXYGEN CLOSED-CIRCUIT BREATHING APPARATUS
E. J. Kloos, A. J. Beckert, and R. H. Schultz Oct. 1968 15 p refs
(BM-RI-7192)

Two self-contained breathing apparatus of the closed-circuit compressed-oxygen type were evaluated for performance at 32° to −25°F. Low-temperature effects of oxygen and carbon dioxide concentration, visual properties of the facepiece, and mechanical operation of the apparatus were studied. Although operation varied with the wearer, his breathing rate, the apparatus precooling time, and the temperature, results suggest that general use of currently approved compressed-oxygen closed-circuit breathing apparatus be limited to temperatures above 32°F. Author

N68-34929# Joint Publications Research Service, Washington, D. C.
FP FIBROUS FILTERING MATERIALS
I. V. Petryanov, B. I. Kozlov, P. I. Basmanov, and B. I. Ogorodnikov 12 Sep. 1968 79 p refs Transl. into ENGLISH of the book "Voloknistyye Fil'truyushchiye Materialy FP" Moscow, Znaniye Press, 1968 78 p
(JPRS-46419) CFSTI: HC$3.00/MF$0.65

The use of FP (Petranov filters) filtering materials is discussed in terms of fine air purification at atomic installations and research facilities requiring air purification control methods. These FP filters, consisting of ultrafine polymer fibers, are highly effective in retaining the finest particles including those with relatively low hydrodynamic resistance. A series of short reports discusses aerosols, their particle sizes, stability, physico-chemical properties, and optical properties; and the observation and danger of highly dispersive aerosols. Structure, shape and size, properties, and service life of FP filtering materials are considered; and attention is given to protection of the respiratory organs and various air purification techniques. M.W.R.

N68-34931*# Ohio State Univ. Research Foundation, Columbus.
CARDIOVASCULAR EFFECTS OF VIBRATION, PART 1 Final Report, 1 Jan.–31 Jul. 1968

Lester B. Roberts Aug. 1968 65 p refs
(Grant NGR-36-008-041)
(NASA-CR-96882, RF-5, Pt. 1) CFSTI: HC $3.00/MF $0.65 CSCL 06S

The ECG was studied first to determine how clinically useful ECG tracings could be obtained from human subjects undergoing severe vibration. In order to evaluate equipment, procedures, and techniques, ECGs were obtained and averaged from six male volunteers while they were being vibrated Gz at vibration intensities from moderate to severe. The vibrations did not exceed one minute for moderate intensities or one-half minute for severe intensities. The study included the selection and modification of existing equipment, selection of adequate electrodes, development of optimum skin preparation techniques, and adaptation of signal-averaging techniques to the ECG signal. K.W.

N68-34940 Arizona Univ., Tucson.
COMPARISON OF THE STRUCTURE OF PROTEINS IN THE CRYSTALLINE AND SOLUTION STATE
Melvin Praissman (Ph.D. Thesis) 1967 197 p
Available from Univ. Microfilms: HC $9.00/Microfilm $3.00 Order No. 67-16516

The structures of several proteins have recently been determined using crystallographic methods of analysis and have greatly increased our understanding of protein structure. However, it is the molecule in dilute solution that is generally of chemical and physiological importance and it is therefore necessary to assess the effect of crystallization upon protein conformation. Hydrogen exchange is a sensitive indicator of structure and a technique that can be used for the exploration of differences between the phases. The hydrogen exchange properties of insulin were examined over the pH range 2 to 10 and at several temperatures and ionic strengths. In solution, the hydrogen exchange of insulin was at a minimum near pH 3 and increased with increasing pH and temperature; exchange behavior characteristic of other proteins. Dissert. Abstr.

N68-35053 Fordham Univ., New York.
ACCURACY OF POSITION JUDGMENTS OF STATIONARY TARGETS YIELDED BY THREE TYPES OF PERCEIVER OF THE AMES TRAPEZOID ILLUSION
Mary Carol Cahill (Ph.D. Thesis) 1967 119 p
Available from Univ. Microfilms: HC $5.80/Microfilm $3.00 Order No. 67-11483

The rationale of this research was that ability to perceive correctly the orientation of a stationary target form in space is related to the amount of apparent reversal seen when the target is rotated. The hypothesis was that Perceiver Groups which differed in the extent to which they perceived the reversal illusion would be significantly differentiated in terms of judging accuracy. It was expected that the High Group of reversal perceivers would have the greatest number of incorrect judgments, the Intermediate Group the next greatest, and the Low Group the least. In the first phase of the experiment, the three members of each Perceiver Group observed each of four targets (windowed and windowless trapezoids and rectangles) in rotation at each of five viewing distances, recording the number of apparent reversals seen under each condition. The second part of the experiment was also designed to provide information on the effects on judging accuracy of distance, target form, and target windowedness. Dissert. Abstr.

N68-35069*# National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Aug. 1968 154 p refs
(NASA-SP-7011(53)) CFSTI: HC $3.00/MF $0.65 CSCL 06S

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N68-35102*# Lafayette Clinic, Detroit, Mich.
SYSTEM AND PROCESS DEVELOPMENT FOR SELECTION OF HIGH STRESS TOLERANCE PERSONNEL
Albert F. Ax Washington NASA Sep. 1968 84 p refs
(Contract NAS2-1031)
(NASA-CR-1122) CFSTI: HC $3.00/MF $0.65 CSCL 06B

A system was developed for digital computer processing of psychophysiological data. It employs oscilloscope and oscillograph display, analog magnetic tape storage, A/D conversion, digital tape storage and a large digital computer (IBM 7094). The computing programs developed select all points of interest and compute their type, time of occurence, amplitude and curvature. Two substantive studies were completed. The classical conditioning of autonomic responses in schizophrenia and healthy subjects demonstrated a marked impairment in the performance of autonomic conditioning by schizophrenic patients. A pilot study of non-schizophrenic low motivation subjects revealed a disability for autonomic conditioning similar to that found in chronic schizophrenia. These findings suggest that autonomic conditioning may serve as an index for the diagnosis of both schizophrenia and low motivation and permit the speculation that a low aptitude for autonomic learning may be a contributing factor to both schizophrenia and low social motivation. Finally a study of physiological concomitants of psychological differentiation suggests that the degree of autonomic response differentiation may be correlated with the cognitive style of perceptual discrimination. Author

N68-35103*# Stanford Research Inst., Menlo Park, Calif.
RELATIVE ANNOYANCE AND LOUDNESS JUDGEMENTS OF VARIOUS SIMULATED SONIC BOOM WAVEFORMS
L. J. Shepherd and W. W. Sutherland Washington NASA Sep. 1968 59 p refs
(Contract NAS1-6193)
(NASA-CR-1192; LR-20922) CFSTI: HC $3.00/MF $0.65 CSCL 05E

A series of investigations were initiated in an effort to assess the effect of sonic boom signature modification on human subjective response, using Lockheed's sonic boom simulation facility. Subjective response was found to be influenced by changes in several signature parameter, including rise time, interpeak duration, and the addition of short duration transients to the signature bow wave. Detailed descriptions and the results of this series of experiments are described. Author

N68-35109*# Stanford Research Inst., Menlo Park, Calif.
RESEARCH STUDY OF A FUNDUS TRACKER FOR EXPERIMENTS IN STABILIZED VISION
D. H. Kelly and H. D. Crane Washington NASA Sep. 1968 49 p refs
(Contract NAS2-3995)
(NASA-CR-1121) CFSTI: HC $3.00/MF $0.65 CSCL 06B

An image stabilization method is discussed that involves the tracking of retinal blood vessels amd other structures of the back of the eye—i.e., a fundus tracker. The method involves projecting a scanning pattern onto the retina, and detecting the translational and rotational movements of the reflected pattern by means of a certain type of high-speed correlation processing of the video signal. A particularly simple, circular scan method for this purpose is implemented by inverting a standard fundus camera in order to project the scan pattern onto the retina. The correlation processing

is presently simulated on a digital computer at slow speed. This simulation program will be used for overall evaluation of the tracking system as well as to help in design of the required high-speed correlation equipment. This fundus tracker technique may provide greater precision of tracking than is provided by contact-lens techniques, as well as the potential for greater convenience of use. Author

N68-35135# California Univ., Livermore. Lawrence Radiation Lab.
TECHNIQUES FOR REDUCING ELECTRICAL NOISE PICKUP IN BIOMEDICAL COUNTING INSTRUMENTATION
Paul L. Phelps, Frank A. Newbold, and Douglas L. Sawyer *In its* Noise Reduction Conf. [1968] p 205–212 refs (See N68-35118 22-23)

An x-ray spectrochemical system used for the elemental analysis of biological tissues was found to be producing data that deviated from the expected statistical limitations. The associated electronic detection system consisted of a photomultiplier, preamplifier, linear amplifier and single channel discriminator. Several sources of electrical interference were discovered near the system and at remote points and shown to be the cause of erratic data. Electrical radiation from oscillating fluorescence lamps was judged to be the chief source of noise. Also other electrical distrubances were found to be conducted to the system via power lines and the electrical ground. The preamplifier was repackaged, suitable filters incorporated into the supply voltage leads, all cables were shielded and properly grounded, and a new electrical ground was established. The system is judged now to be immune from the sources of noise encountered and has performed satisfactorily for more than 24 months. Author (NSA)

N68-35155*# General Dynamics/Convair, San Diego, Calif. Life Sciences Lab.
FEASIBILITY STUDY OF A CENTRIFUGE EXPERIMENT FOR THE APOLLO APPLICATIONS PROGRAM. VOLUME 4: MANNED CENTRIFUGE TEST REPORT Final Report
15 Aug. 1968 77 p refs
(Contract NAS1-7309)
(NASA-CR-66684; GDC-DCL-68-004; SRC-MS-302) CFSTI: HC $3.00/MF $0.65 CSCL 06B

Oculogyral Illusion (OGI) threshold for cross-coupled acceleration was studied with 10 qualified SCUBA personnel who passed Class III flight physicals, as was the vestibular cross-coupled acceleration threshold for Response Analysis Tester (RATER) performance degradation with resultant acceleration in pitch plane. The OGI experiment demonstrated the importance of relative time for tilts to produce equivalent acceleration. In the RATER experment, even the most severe dynamics did not result in any appreciable degradation in overall test performance, and no nausea or stomach disturbance was detected in any of the subjects. Passive tilting, with the RATER task display fixed relative to the subject, appeared to result in adequate visual stabilization to discourage spatial disorientation. These ground based experiments were made to enable prediction of stability control requirements and subject tolerance limits for an orbital centriguge concept in connection with the Apollo Applications Program. Physiological implications, vectoroculograph and electro-oculograph recordings, and the dynamic analysis of cupular stimuli are discussed; along with the test facility design and operation. M.W.R.

N68-35156*# Denver Univ., Colo. Dept. of Chemical Engineering.
CYCLIC OPERATION OF ADSORPTION BEDS FOR USE IN SPACECRAFT LIFE SUPPORT SYSTEMS Semiannual Report, 15 Dec. 1967–15 Jun. 1968
Lawrence W. Ross Jul. 1968 11 p refs
(Grant NGR-06-004-068)
(NASA-CR-96949) CFSTI: HC $3.00/MF $0.65 CSCL 05K

A mathematical model was developed for the carbon dioxide adsorption system behavior of the Apollo spacecraft life support system in order to study the application of cyclic modes of operation to a recovery system. The equilibrium relation between solid-phase concentration and interfacial gas-phase concentration of CO_2 was assumed to be linear for mass transfer during adsorption. Axial diffusion made no significant contribution to the gas phase equation, and heat transfer equations for the gas and solid phases had the same form. Data from measurements made by a prototype adsorption unit showed that the model closely matched results if a mass transfer coefficient of k = 7 was assumed; a value of 5.7 was reported from diagrams that did not use the proposed model. M.W.R.

N68-35176 Indiana Univ., Bloomington.
A MODEL OF THE RESPONSE PATTERNS OF SINGLE CELLS IN THE MACAQUE LATERAL GENICULATE NUCLEUS
Israel Abramov (Ph.D. Thesis) 1967 126 p
Available from Univ. Microfilms: HC $6.20/Microfilm $3.00 Order No. 67-15059

A quantitative model of these response functions is proposed. Spectrally opponent cells clearly receive inputs from at least two subsystems (excitatory and inhibitory) of different, but overlapping, spectral sensitivities, and the recorded responses represent some sort of difference between these inputs. Data were available from situations using chromatic adaptation to isolate the inputs from these subsystems. The action spectra of the isolated mechanisms appear to match the absorption spectra found for single primate cones, and the responses are described as linear functions of the log effective (absorbed) energy. It seems that the isolated inputs to LGN cells directly reflect cone responses. It is shown that each opponent cell receives inputs only from two of the three cone types. This is done by using stimuli which should be metamers, and elicit the same responses, if only two systems are involved, but not if there is any real contribution from a third system. Dissert. Abstr.

N68-35180*# Case Western Reserve Univ., Cleveland, Ohio. Solid State Electronics Lab.
[INVESTIGATION OF IMPLANTABLE MULTICHANNEL BIOTELEMETRY SYSTEMS] Semiannual Report Sep. 1967–Feb. 1968
W. H. Ko, E. Yon, W. Thompson, and D. Ramseth Jul. 1968 13 p *Its* Case No. 42-364
(Grant NGR-36-003-079)
(NASA-CR-96891; SAR-4) CFSTI: HC $3.00/MF $0.65 CSCL 06B

Progress in the development of multichannel, physiologically implantable telemetering systems for biological measurements is reported. A single-channel FM/FM strain gage transmitter implanted in a dog one year ago continues to function except for a strain gage pickup failure. Performance and operational maintenance of an implanted four-channel transmitter system is discussed. Telemetering both ECG and EEG signals with an eight-channel transmitter setup is briefly described. A receiving and demodulating system was expanded to accept eight channels of information. An active, low-pass filter with a break point of 150 Hz was bread-boarded and incorporated into the output circuitry of sample and hold circuit boards in the demodulator. The filter was used in the demodulation of the ECG and EEG signals. Circuitry was breadboarded to allow the demodulator to accept variations in the transmitter ring-oscillator frequency, thus making possible the use with several transmitter systems without demodulator ring oscillator adjustment. K.W.

N68-35181# Joint Publications Research Service, Washington, D. C.
PROBLEMS IN SPACE TOXICOLOGY

V. V. Kustov 11 Sep. 1968 11 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), Jul.–Aug. 1968 p 605–608
(JPRS-46403) CFSTI: HC$3.00/MF$0.65

This article examines the problems in formulating the air environment in hermetically sealed rooms. It discusses findings on the liberation of toxic substances from various plastics into the cabin atmosphere and the principles and methods of medical-toxicological evaluation of polymer materials used in equipping the cabins of devices for space flight. An analysis is given of the literature on the hygienic significance of the products of human vital activity and feasible ways of setting the extreme tolerable limits thereof in the atmosphere of hermetically sealed cabins. Author

N68-35207# Naval Submarine Medical Center, Groton, Conn. Submarine Medical Research Lab.
THE CODE COPYING CAPABILITIES OF RADIOMEN UNDER SIMULATED ATMOSPHERIC NOISE CONDITIONS Interim Report
Alan M. Richards May 1968 10 p refs
(SMRL-523; AD-672893)

The code-copying ability of Navy radiomen at various signal-to-noise (S/N) ratios under four conditions of simulated atmospheric noise, and under white noise, was tested. It was found that when a white noise was used, a critical S/N ration was reached where code copy deteriorated markedly. Prior to this point, code copy appeared to be undisturbed. When the simulated atmospherics were used, no appreciable deterioration in code copy occurred at any of the S/N ratios sampled. It was pointed out, however, that equivalent S/N ratios for white and atmospheric noise are not necessarily the same. Therefore, qualifications must be made to a direct comparative analysis between simulated atmospherics and white noise maskers. It was further pointed out that if the S/N ratios for the atmospherics were lowered, some critical S/N might have been reached, as in the case of white noise, where code copy deteriorated rapidly. If this were the case, then a simple reduction of X decibels would be all that was necessary to generalize the obtained performance criteria obtained under white noise to atmospherics. Author (TAB)

N68-35212# Harvard School of Public Health, Boston, Mass. Guggenheim Center for Aerospace Health and Safety.
THE EFFECTS OF PHYSICAL AND SYMBOLIC STRESSORS ON PERCEPTIVE MECHANISMS Annual Progress Report, 1 Feb. 1967–31 Mar. 1968
Ross A. MacEarland, Warren H. Teichner, and Diane E. Olson 1 Jun. 1968 8 p
(Grant AF-AFOSR-1281-67)
(AFOSR-68-1516; AD-672275)

The research was concerned with the development of an approach to and methods for the prediction of human performance under conditions of environmental and informational stress. Emphasis was put upon attention and short-term memory in relation to temperature, noise and hypoxia, and to the development of attentional criteria of conditions which may be thought of as overstressing. This was done within a systematic context which relates physiological regulatory mechanisms to behavioral mechanisms. Author (TAB)

N68-35219# Tufts Univ., Medford, Mass. Human Engineering Information and Analysis Service.
TRENDS AND DEVELOPMENTS IN VISUAL DISPLAYS Final Report
Mason N. Crook, Margaret W. Raben, and Edward A. Wade Dec. 1967 68 p refs
(Contract Nonr-494(13))
(HEIAS-107; AD-673091)

Selected emphases in the literature of displays are surveyed, including: approaches directed at systematizing one aspect or another of the field; reviews and techniques concerned with comparative evaluations within particular display categories; characteristics of the operator, which are important for display design; recent developments (pictorial displays especially) divised to exploit more fully the operators capacities; and potential new areas of display application. Author (TAB)

N68-35233# System Development Corp., Santa Monica, Calif.
UPDATING SOME GROUND RULES FOR MAN-MACHINE SIMULATION
R. J. Meeker and G. H. Shure Apr. 1968 15 p refs
(Contract DAHC15-67-C-0277)
(SDC-SP-3143; AD-672783)

This paper proposes to show that the techniques and research designs borrowed from the highly abstract, sterilized, easily replicable experiments of the social scientist are, in part, responsible for the failure both to evaluate simulation methodology and to make significant research gains through simulation studies. With the availability of a large-scale, computer-based laboratory, techniques are now available for overcoming many of the serious limitations associated with the problems of data collection and analysis, particularly the difficulty of timely assessment and recording of data on large number of subjects in the precise detail and volume required: and secondly, the problem of usefully analyzing such an enormous and complex body of data. We propose to show that in our own research program the use of large-scale computer-based laboratory permits significant inroads to be made into methodological and validity problems of simulation, which remain relatively intractable under attacks of a smaller scale. Author (TAB)

N68-35315# School of Aerospace Medicine, Brooks AFB, Tex.
A TECHNIC FOR PHOTOGRAPHING HUMAN RETINAL CIRCULATION DURING BLACKOUT ON THE USAFSAM HUMAN CENTRIFUGE
Voris A. Kirkland, Sidney D. Leverett, Jr., and William A. Newsom Mar. 1968 11 p ref
(SAM-TR-68-27; AD-672767)

To study the human retina on a moment-to-moment basis during the rapid sequence of events occurring before, during, and after a blackout episode on the human centrifuge requires a technic which will not harm the subject, yet will allow constant viewing. In a previous study an ophthalmoscope was used to study the retinal changes and then the subjective impressions of the investigator were recounted to a medical illustrator. A method has now been developed using a modified Zeiss fundus camera which allows photographs to be taken of the retinal circulation every 0.6 second during the entire +G maneuver at the subjects blackout level. Author (TAB)

N68-35346# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BIOELECTRIC CONTROL [BIOELEKTRICHESKOYE UPRAVLENIYE]
I. Akulinichev 28 Sep. 1967 9 p Transl. into ENGLISH from Med. Gazeta (Moscow), 25 Feb. 1966 p 1
(FTD-HT-67-282; AD-672910)

The document discusses the history and development of prosthetics, especially as it relates to bioelectrically controlled forearm prostheses. Prominent personalities in the development of bioelectric prosthetics are noted. Studies of bioelectrically actuated forearm prosthetics have been conducted on more than 800 invalids. The author foresees the application of the principles of bioelectrical control systems in manned spaceflight. Author (TAB)

N68-35382# Naval Air Development Center, Johnsville, Pa. Aerospace Medical Research Dept.
PULMONARY HYPERTENSION RESULTING FROM OXYGEN EXPOSURE
George H. Kydd 5 Jun. 1968 25 p refs
(NADC-MR-6802; AD-672755)

Rats exposed to an atmosphere of 95 to 100% oxygen at a partial pressure of 516 mm Hg for periods of 30 days showed no obvious abnormalities. At the end of this exposure they were removed from the system and anaesthetized. Aortic and intratracheal pressures were measured by standard direct procedures in response to breathing air and oxygen and to transient increases in intratracheal pressure. Compared with the results in unexposed rats, the experimental animals showed an increase in pulmonary arterial pressure (PAP) and a decrease in mean aortic pressure. The increase in aortic pressure caused by breathing oxygen which was present in the unexposed animals could be elicited in the exposed rats. The increase in PAP is attributed to structural changes in the pulmonary vasculature associated with oxygen exposure and it is postulated that an increase in vascular resistance is responsible for a decreased cardiac output, giving rise to the systemic hypotension. Whereas mean aortic pressure fell during increased intratracheal pressure, mean pressure from the right heart did not change, suggesting that the right ventricle empties itself less well against the increased pressure. Author (TAB)

N68-35388# Florida Presbyterian Coll., St. Petersburg. Primate Neuro-Sciences Lab.
THE EFFECT OF DIFFERENTIAL REARING ENVIRONMENTS ON SELECTED BODY ORGANS OF MACACA MULATTA Final Report, 6 Oct. 1967–15 Mar. 1968
W. F. Angermeier, John B. Phelps, and Herbert H. Reynolds Holloman AFB, N. Mex. ARL Jul. 1968 32 p refs
(Contract F29600-68-C-0007)
(ARL-TR-68-8; AD-672822)

Twenty-six male rhesus monkeys were sacrificed and organ pathology was completed, the following measures were taken: body weight, brain weight, thymus weight, adrenal weight, brain/body ratio, thymus/body ratio, adrenal/body ratio and gross and microscopic organ pathology. Differences between these measures based upon (1) early rearing experience and (2) shock-induced stress exposure were not significant. Intercorrelations between these measures were also computed. A number of them were found to be significant. Performance on a shock-escape match-to-sample task was found to correlate significantly with brain weight and brain/body ratio. Findings of this study do not agree with results of similar studies conducted on rats. Author (TAB)

N68-35393# Ohio State Univ., Columbus.
EFFECTS OF DISCRETE SKIN COOLING ON BODY TEMPERATURE AND SWEAT PRODUCTION DURING MODERATE HEAT STRESS Final Report, 1 Jan.–1 Jul. 1966
Thomas G. Byrne May 1968 72 p refs
(Contract AF 33(615)-2053)
(AMRL-TR-66-188; AD-673000)

Physiological responses to moderate heat stress were studied in a heat chamber for periods of 2 hours. Five conditions were established (two control series and three cooling series). Measured variables included heart rate, sweat produced, and rectal temperature. Thirty-eight experiments were done, involving eight subjects. The data were subjected to both conventional statistical analysis and computer techniques. Author (TAB)

N68-35434# School of Aerospace Medicine, Brooks AFB, Tex.
CHANGES IN PULMONARY VENTILATION, GAS METABOLISM, AND ENERGY EXPENDITURE DURING WEIGHTLESSNESS [IZMENENIE POKAZATELEI VNESHNEGO DYKHANIYA, GAZOOBMENA I ENERGOTRAT V USLOVIYAKH NEVESOMOSTI]
I. I. Kasyan, G. F. Makarov, and B. V. Blinov 1968 13 p refs Transl. into ENGLISH from Russian Presented at the 18th Congr. of Intern. Astronautical Federation, Belgrade, 25–30 Sep. 1967
(SAM-TT-R-942-0468; AD-672800)

The fact that gas metabolism and energy expenditure are more intense during weightlessness than during horizontal flight or G-loading leads to the conclusion that zero-G can greatly effect the human body. Cosmonaut energy expenditure in the space cabin or spacesuit will greatly exceed that recorded during brief zero-G or on earth. Thus, determining the energy expenditure required for various operations by the cosmonaut in space is of paramount significance. Author (TAB)

N68-35455# Flight Safety Foundation, Inc., New York.
GENERAL AVIATION PILOT EDUCATION PROGRAM Final Report
Warren L. Cole Sep. 1967 127 p refs
(Contract FA-65-WA-1350)
(FAA-FS-67-1; AD-673159)

General Aviation Pilot Education (GAPE) was a safety program designed to improve the aeronautical education of the general aviation pilot in anticipation that the national aircraft accident rate might be improved. GAPE PROGRAM attempted to reach out to the average general aviation pilot with specific and factual information regarding the pitfalls of his contemporaries who were involved in aircraft accidents and what he could do to avoid them. The program employed statistical analyses, publications, programmed training devices, speaking presentations and surveys as the tools with which to administer the program. Author (TAB)

N68-35463# School of Aerospace Medicine, Brooks AFB, Tex.
SPACE PHYSIOLOGY [KOSMICHESKAYA FIZIOLOGIYA]
O. G. Gazenko, V. V. Parin, V. N. Chernigovskii, and V. I. Yazdovskii 1968 22 p refs Transl. into ENGLISH from Russian Presented at the 10th Congr. of the All Union Physiol. Soc. in Honor of I. P. Pavlov, Erevan, 22–28 Oct. 1964
(SAM-TT-R-733-0268; AD-672802

The goal of space physiology is to study the character and peculiarities of space flight stresses brought to bear on the organism of animals and man. The emphasis is on basic investigation--to seek out rational ways of increasing mans tolerance to space flight and to determine the basic, physiologic demands of a given organism on a spacecrafts environment and equipment complex. It is in this light that conditions amenable to optimal crew performance must be sought. The influence on the body of three basic groups of factors is discussed: (1) Those associated with the dynamics of space flight (acceleration, weightlessness, vibration, etc.); (2) Those associated with long missions in the artificial environment of a space capsule (microclimate, isolation, hypodynamia, etc.); and (3) Those which characterize outer space as a unique environment of habitation (radiation, temperature or thermal conditions, etc.). Author (TAB)

N68-35465# School of Aerospace Medicine, Brooks AFB, Tex.
PROGRAMMED PHYSIOLOGICAL MEASUREMENTS AND THEIR USE DURING VOSKHOD SPACE MISSIONS [METODIKA PROGRAMMIROVANNYKH FIZIOLOGICHESKIKH IZMERENII I OPYTEE PRIMENENIYA NA KOSMICHESKOM KORABLE VOSKHOD]
R. M. Baevskii and D. G. Maksimov 1968 27 p refs Transl. into ENGLISH from Kosmich. Issled. (Moscow), v. 4, no. 5, 1966
(SAM-TT-R-946-0468; AD-672801)

Experiments were performed involving the use of programmed physiological research on the Voskhod spacecraft. Using but one radiotelemetry channel to record three, single-phase tests requiring

a total of ten minutes, a great volume of data and new facts of interest concerning the impact of zero gravity on the various organic systems were obtained. The Voskhod space mission pointed out the feasibility of conducting medical research along the lines of a specific program performed by the cosmonauts themselves, the expedience of using the removable sensors and electrodes, and the feasibility of relaying a great quantity of data utilizing a limited number of telemetry channels. At the same time, the experiment indicated the proficiency of cosmonauts in executing specific tasks. Author (TAB)

N68-35507# National Academy of Sciences—National Research Council, Washington, D. C. Committee on Hearing Bioacoustics Biomechanics.

PROPOSED DAMAGE-RISK CRITERION FOR IMPULSE NOISE (GUNFIRE)

W. Dixon Ward Jul. 1968 13 p refs
(Contract Nonr-2300(05))
(AD-673223)

Contents: Proposed criteria (definitions, basic criterion, and correction factors); Explanation and justification; and Limitations. TAB

N68-35548*# Cornell Aeronautical Lab., Inc., Buffalo, N. Y.

HUMAN TRANSFER CHARACTERISTICS IN FLIGHT AND GROUND SIMULATION FOR THE ROLL TRACKING TASK Final Technical Report

Wright-Patterson AFB, Ohio AF Flight Dyn. Lab. Apr. 1968 77 p refs Sponsored in part by NASA
(Contract AF 33(615)-3605)
(NASA-CR-97017; CAL-TE-2256-F-1; AFFDL-TR-67-30; AD-671540) CSCL 05E

The mathematical description of human pilot dynamic characteristics has been based primarily upon data obtained in constrained ground-based simulator experiments. Whether or not it is valid to extrapolate the use of these descriptions to actual flight is a prevalent question. Reported herein are data which describe the pilot's dynamics in both ground-based simulator and actual flight situations for the constrained situation of a compensatory roll tracking task, additionally, data are presented for ground-based simulator measurements of pilot dynamics as the pilot controls a simple integrator system and a divergent system. Author (TAB)

N68-35567# Deutsche Versuchsanstalt Fur Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. Fuer Flugmedizin.

THE MODIFICATION OF THE CIRCADIAN RHYTHM BY AGE AND SEX IN HUMANS [ZUR MODIFIZIERUNG DER MENSCHLICHEN 24-STUNDENRHYTHMIK DURCH ALTER UND GESCHLECHT]

Ruediger Finger Jun. 1968 69 p refs In GERMAN; ENGLISH summary
(DVL-783; DLR-FB-68-31) CFSTI: HC $3.00/MF $0.65

The oral temperature, vital capacity, optical reaction time, and circulatory function according to the Schneider test were measured every three hours in three different groups to evaluate the effects of age and sex on the circadian rhythm. Average age and sex of the groups were as follows: female and 23, male and 26, and male and 47. Except for the expected differences in the mean values, the temporal position of the positive and negative extreme values differed between the groups for blood pressure, vital capacity, and reaction time. Most of the variables showed group differences in the range of oscillation, the biggest difference appearing in oral temperature between males (0.7° C) and females (0.4° C). When the oscillation ranges of all the measured parameters were averaged, the oscillation ranges of the older males and the females were similar, and both were smaller than the one of the younger males. The correlation between mean values and oscillation ranges was mostly positive, except for some variables in the female group and the Schneider index in all groups. Author

N68-35607*# Naval Aerospace Medical Inst., Pensacola, Fla.

EVALUATION OF SIXTEEN ANTIMOTION SICKNESS DRUGS UNDER CONTROLLED LABORATORY CONDITIONS

Charles D. Wood and Ashton Graybiel 7 Aug. 1968 11 p refs
(NASA Order R-93)
(NASA-CR-97039, NAM1-983) CFSTI: HC $3.00/MF $0.65 CSCL 06O

The effectiveness of a drug in reducing susceptibility to acute motion sickness is readily determined in a slow rotation room (SRR) where the stressful Coriolis accelerations are under quantitative control and the experimenter and subject can collaborate under laboratory conditions. Fifty subjects were used, each serving as his own control, in evaluating 16 representative antimotion sickness drugs. Only the drugs with a sympathomimetic or parasympatholytic action and some of the antihistamines were notably effective. The summation effect of dextroamphetamine sulfate and l-scopolamine hydrobromide provided far better protection than any single drug. Other classes of drugs had either a slightly favorable or slightly unfavorable action. Author

N68-35658# Massachusetts General Hospital, Boston.

IMMEDIATE STIMULATING PROPERTIES OF X-RAYS Progress Report, 1 May 1967–30 Apr. 1968

John Garcia 30 Apr. 1968 27 p refs
(Contract AT(30-1)-3698)
(NYO-3698-1) CFSTI: HC $3.00/MF $0.65

Studies were conducted on sensory perception of X-rays by rats. The problem as to whether the stimulating influence is exerted directly on the olfactory receptors or by way of airborne products is of particular interest. Rats are being trained to discriminate between flickering and steady state exposure to X-rays The effects of X radiation on the frog heart were studied, and it was found that the rate of beating decreased. Experiments with atropine indicated that the radiation caused the release of acetylcholine from synaptic endings of the vagus nerve. In vivo and in vitro preparations of guinea pig intestine (ilium) showed increased tone after the onset of X radiation. Similar changes were seen in uterine preparations. Effects of serum from γ-irradiated rats caused marked increase in tone of the ilium in vitro. Radioinduced aversions to water flavored with hydrochloric acid or quinine were produced in rats. It was found that drinking a low preference fluid during X radiation caused a decrease in preference while drinking the same fluid without exposure caused an increase in preference. NSA

N68-35667# Gottingen Univ. (West Germany).

BIOREGENERATION IN A CLOSED SYSTEM USING WATER ELECTROLYSIS AND BACTERIA [BIOREGENERATION IM GESCHLOSSENEN SYSTEM MIT HILFE VON ELEKTROLYSEGAS UND BAKTERIEN]

D. Hermann, E. Schuster, R. Lafferty, and J. Rudolph Bad Godesberg Bundesministerium Fuer Wiss. Forsch. Jun. 1968 65 p refs In GERMAN; ENGLISH summary
(BMwF-FB-W-68-46) CFSTI: HC $3.00/MF $0.65

The growth parameters for Hydrogenomonas strain H 16 were determined under conditions of continuous culture with formation of H_2-O_2 mixture by direct electrolysis of the culture medium. Using this method, a cell concentration of 3 g dryweight/l was achieved, whereas with an external gas supply the cell concentration reached 28 g dryweight of bacteria/l. Further topics to be reported on are: the development of new culture vessels, the isolation and characterization of new species and strains of hydrogen-oxydizing bacteria, the determination of polysaccharide content, the production of bacterial mutants and metabolic regulation. The future development of an electrolysis-bacterial system for bioregeneration accompanied by oxygen and protein production is favourably viewed. Author

N68-35669# Sandia Corp., Albuquerque, N. Mex.
LASER EYE AND SKIN HAZARD EVALUATIONS
W. D. Burnett May 1968 19 p refs Presented at Am. Ind. Hyg. Conf., St. Louis
(Contract AT(29-1)-789)
(SC-RR-68-174; CONF-680503-5) CFSTI: HC $3.00/MF $0.65

Laser eye and skin hazards are evaluated by comparing direct exposure intensity levels on the surface of the eye or skin to exposure guidelines equal to threshold effect levels where the skin or cornea is affected and conservatively safe levels based on worst case assumptions where the retina is affected. Equations are presented for calculating the exposure intensity when the laser beam parameters and the range are known. Intensity amplification factors of the eye are indicated for the three cases encountered in practice: where simple geometric optics apply, where the laser beam divergence angle is limiting, and where Fraunhofer diffraction effects are limiting. Diffraction effects predict the maximum eye intensity amplification and hence define the worst case for retinal exposure. The resultant exposure guidelines are summarized and estimates made of the associated safety factors. Author (NSA)

N68-35670# Oak Ridge National Lab., Tenn.
BIOHAZARDS OF AEROSPACE NUCLEAR SYSTEMS
Dec. 1967 35 p refs Prepared for Sandia Corp., Albuquerque, N. Mex.
(Contract AT(29-1)-789)
(SC-CR-67-2845) CFSTI: HC $3.00/MF $0.65

In support of the aerospace nuclear safety program, analytical and experimental studies were made on the potential hazards in the use of $^{238}PuO_2$. These studies included calculations which showed that for a sedentary subject no microsphere of PuO_2 larger than 170 microns could be inhaled into the nose. A computer program was written to determine various fluid dynamical properties of particles having densities from 1 to 12 grams/cm^3. Dosimetric studies included calculations of the α, γ, and neutron dose rates to tissue from the microspheres. Dose rates from the α emission were orders of magnitude higher at close distances than the other radiation emitted. Measurements of the 17 KeV x ray from ^{239}Pu showed greatly decreased transmission through polyvinyl chloride as compared with a plastic material that did not contain chlorine. In manipulating the $^{238}PuO_2$ particles it was discovered that the clean microspheres contaminated the probes, container, and counting equipment with which they come in contact. Author (NSA)

N68-35762# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
NEW TYPES OF SPARK-CHAMBERS FOR IMAGING γ OR X EMITTERS AND THEIR MEDICAL APPLICATIONS [NOUVEAUX TYPES DE CHAMBRES A ETINCELLES DESTINEES A LOCALISER DES CORPS RADIOACTIFS EMETTEURS DE RAYONS X OU γ ET LEUR APPLICATION EN MEDECINE]
Jean Leloup (Ph.D. Thesis—Paris Univ.) 1967 120 p refs In FRENCH
(CEA-R-3320)

In order to adapt spark-chambers to low-energy particles, a first attempt was made using a two-electrode device operating as a proportional counter. The signal obtained triggers a high-voltage pulse which is applied to the same device and a spark occurs near the track of the particle. A three-electrode device including a detection space associated to the sparks space was then used. The spark was formed spontaneously at the point where the particle passed when suitable direct-current voltages were applied to the electrodes; the high voltage is slightly lower than on the other types of chamber. This phenomenon makes the three-electrode device very easy to use for X or γ rays. The characteristics of the first device filled with argon and methane are given and the first results obtained in the medical field with a device filled with xenon methylal are presented. Author (NSA)

N68-35763# Brussels Univ. (Belgium).
RADIOBIOLOGICAL APPLICATIONS OF CELLULAR PHYSIOLOGY [APPLICATIONS RADIOBIOLOGIQUES DE LA PHYSIOLOGIE CELLULAIRE.] Final Report, 1961–1966
Dec. 1967 138 p refs In FRENCH
(Contract EURATOM-004-59-12 BIAB)
(EUR-3607)

A coordinated effort was carried out to analyze the mechanisms controlling protein synthesis in biological systems of growing complexity: bacteriophages, bacteria, unicellular algae (Acetabularia), the egg in the various stages of its development diffentiated or cancerous cells, the adult mammal. Genetic, biochemical, biophysical, and cytochemical methods were combined to achieve this end. The results obtained should form a useful basis for the study of the effects of radiation at molecular level. Author (NSA)

N68-35769*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EFFECT OF TIME OF HEATING ON THE THERMAL POLYMERIZATION OF L-LYSINE
Milton R. Heinrich, Duane L. Rohlfing, and Ester Bugna 3 Sep. 1968 25 p refs
(NASA-TM-X-62002) CFSTI: HC $3.00/MF $0.65 CSCL 06A

Several parameters of the thermal polymerization of L-lysine free base at 195°C were investigated over the time period from 15 minutes to 4 hours. Free lysine disappeared within one hour. The concentration of α-aminocaprolactam and of oligomers of several sizes reached a maximum after 30–45 minutes, and subsequently decreased. Molecular size, as judged by biuret color intensity and by gel filtration, increased rapidly and, in part, ultimately exceeded 100,000. Racemization was extensive and paralleled the disappearance of free lysine. Catalytic activity for the decarbozylation of oxaloacetic acid increased rapidly and reached a maximum after 2 hours. Dinitrophenylation and subsequent hydrolysis indicated that the polymers were branched, and that the linear portions contained more ϵ- than α-peptide bonds. A partial understanding of the method of chain growth could be inferred. Author

N68-35779# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
CONTRIBUTION TO THE STUDY OF PLASMATIC FIBRINOGEN AND SERUM ALBUMIN: EFFECTS OF IRRADIATION [CONTRIBUTION A L'ETUDE DU FIBRINOGENE ET DE LA SERUM-ALBUMINE PLASMATIQUES EFFETS DE L'IRRADIATION]
Michel Suscillon (Ph.D. Thesis—Grenoble Univ.) 1967 119 p In FRENCH
(CEA-R-3012)

Effects of low-energy X-rays on properties and structure of serum albumin and fibrinogen were studied. A technique for amperometric determination of the fibrin stabilizing factor is presented. The kinetics of fibrin formation was studied by means of spectrophotometry. Platelet fibrinogen was demonstrated and determined quantitatively. NSA

N68-35831# Oak Ridge National Lab., Tenn.
ALGAM: A COMPUTER PROGRAM FOR ESTIMATING INTERNAL DOSE FROM GAMMA-RAY SOURCES IN A MAN PHANTOM
G. C. Warner and A. M. Craig, Jr. 10 Jun. 1968 11 p ref
(Contract W-7405-ENG-26)
(ORNL-TM-2250) CFSTI: HC $3.00/MF $0.65

A brief description of ALGAM, A Monte Carlo computer code for estimating internal dose in a man phantom from a variety of gamma-ray exposure situations, is given. Author (NSA)

N68-35844# Oak Ridge National Lab., Tenn.
COMPUTER PROGRAM FOR INBRED AND/OR HYBRID ANIMAL BREEDING AND PRODUCTION COLONIES
B. S. Bishop (Union Carbide Corp.) and M. G. Hanna, Jr. Jul. 1968 145 p refs
(Contract W-7405-ENG-26)
(ORNL-TM-2210) CFSTI: HC $3.00/MF $0.65

Five computer programs were developed to process records on animal breeding and production colonies. The programs provide means for creating and maintaining complete master records on the lineage and current status of the colonies and for, listing as output, supervisory action that has been taken as well as naintenance duties that should be performed. The programs were written in the COBOL language for the IBM-7090 computer. Author (NSA)

N68-35855# European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.
NUCLEAR PYKNOSIS AND THE DEVELOPMENT OF RADIATION DAMAGE IN PERIPHERAL LYMPHOCYTES
J. F. Scaife Jun. 1968 12 p refs
(EUR-3939.e)

An evaluation of a system of biological dosimetry based upon the development of nuclear pyknosis in peripheral lymphocytes in vitro, showed the system to be reproducible in rats and rabbits with a linear response up to 100 R, and a sensitivity of 5 R with results available after 7 hours. With human lymphocytes 24 hours were required to produce an equivalent response which varied from individual to individual and hence can not be established as an overall invariable method of dosimetry. Rabbit lymphocytes labelled with ^{3}H-cytidine were found to disappear from the peripheral circulation very rapidly after reinfusion into the same animal. They were essentially all gone after 60 to 90 min and no difference in the rate of elimination could be discerned for normal or irradiated (200 R) lymphocytes. Author (NSA)

N68-35857# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
TABLES OF LIMITING *t* VALUES FOR PROBABILITIES TO THE NEAREST .001 (*n* = 2–16) Final Report, Sep. 1966–Aug. 1967
Theodore E. Cotterman and Patricia A. Knoop May 1968 56 p refs
(AMRL-TR-67-161; AD-673347)

Tables of t to the nearest .00001 for probabilities within the range of .000 to .500, by increments of .001, are presented for samples of 2 through 16. The 't' values given are the limiting or boundary values having the indicated probability, rather than the closest approximation, thus making interpolation necessary in typical use. The tables are intended primarily as an aid in implementing a purposive probabilistic approach to psychological measurement in which the 't' distribution (or some other appropriate model) is used as a reference in deriving probabilistic behavioral measures. Secondarily, they also may be used to achieve greater precision in specifying the critical 't' for conventional tests of significance. The manner of use is briefly explained, and the way in which they were constructed is described. The Fortran computer program used in constructing them is included. Author (TAB)

N68-35860# Naples Univ. (Italy).
THE EFFECT OF IONIZING RADIATION ON DEVELOPMENT OF EMBRYONIC MOUSE ORGANS Final Report
Elio Borghese Mar. 1968 10 p
(Contract AT(30-1)-3355)
(NYO-3355-31) CFSTI: HC $3.00/MF $0.65

Studies were conducted on the effects or radiation on development of lungs, salivary glands, and kidneys. Effects of X radiation on lung tissue explanted from embryos at the eleventh day of gestation and cultured in vitro were determined. It was found that epithelial growth was enhanced by mesenchyme. X radiation applied in doses from 50 to 400 R inhibited growth. Correlation of lung epithelial growth rate with mitotic rate was studied by means of colchicine treatment. Salivary glands were explanted from embryos at the 13th day of gestation and cultured for seven to nine days; growth was inhibited by X radiation doses of 100 to 500 R. Kidney tissues were explanted at the eleventh day of gestation and studies on development in vitro showed that growth was severely retarded in comparison with normal growth. Studies on ossification in vitro were conducted by explanting cartilaginous anlage of the humerus, radius, and ulna from embryos on the thirteenth day of gestation. NSA

N68-35897# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
EFFECT OF HIGH-ENERGY ELECTRONS ON THE SKIN AND UNDERLYING TISSUES OF THE RABBIT: CLINICAL AND HISTOLOGICAL STUDY [EFFECTS DES ELECTRONS DE HAUTE ENERGIE SUR LA PEAU ET LES TISSUS SOUS-JACENTS DU LAPIN: ETUDE CLINIQUE ET HISTOLOGIQUE]
Gerard Legeay, Henry Vialettes, Jean-Jacques Adnet, Louis Court, and Roland Masse Nov. 1967 45 p refs In FRENCH
(CEA-R-3294)

After briefly considering the mechanism of interaction between the electrons and matter as a function of their energy, the dosimetry carried out as a function of the irradiation device is described. The animals received surface doses of 5,700 to 22,100 rads in the thigh; the electron energy varied from 21 to 30 MeV. Author (NSA)

N68-35907# Max-Planck-Institut fur Arbeitsphysiologie, Dortmund (West Germany). Biomechanische Abteilung.
THEORY OF TOLERANCE TO IMPACT FOR HUMANS [THEORIE DER ERTRAEGLICHKEIT VON STOESSEN FUER DEN MENSCHEN]
R. R. Coermann Jul. 1968 55 p refs In GERMAN Sponsored by Bundesministerium Fuer Wiss. Forsch.
(BMwF-FB-W-68-52) CFSTI: HC $3.00/MF $0.65

In the frequency range 0–9 Hz the human body may be considered in longitudinal direction as a simple one degree of freedom system with a damping factor of d = 0,3. Since the tolerance to impact is determined by the relative displacement of the effective mass, the deformation of such a system with and without damping by impacts with different time history has been calculated. Due to impedance measurement on a centrifuge the non-linear properties of the human body were known. The calculation of the deformation of such a non-linear system has shown that the stress may be much higher than in a corresponding linear system. The optimal elastic properties of protective devices were discussed. Author

N68-35937# General Electric Co., Philadelphia, Pa. Missile and Space Div.
ATMOSPHERE SENSING AND MAINTENANCE SYSTEM Final Report, May 1966–Apr. 1967
David J. Withey and Edward J. Glanfield Wright-Patterson AFB, Ohio AMRL Jun. 1968 47 p refs
(Contract AF 33(615)-3612)
(MSD-15226; AMRL-TR-67-147; AD-673518)

This program encompasses the analysis, design, fabrication and testing of an Atmosphere Sensing and Maintenance System (ASMS) to be used in conjunction with the Aerospace Medical Research Laboratories (AMRL) Life Support System Evaluator (LSSE) chamber or similar space cabin simulators. The ASMS is a two-gas control system capable of monitoring and controlling the total pressure and the oxygen partial pressure of the atmosphere within the LSSE. Oxygen partial pressure is controlled to plus or minus

2.5 mm Hg over the range to 100 to 250 mm of Hg and total pressure is controlled to + 7.5, - 2.5 mm of Hg over the range of 150 to 800 mm of Hg. Monitoring of the oxygen partial pressure and the total pressure of the LSSE atmosphere is possible from either the control panel or the monitors panel of the ASMS. Control of the LSSE atmosphere is possible only from the control panel. The pannels are designed to be interchangeable, to provide control capability either inside or outside of the LSSE with a minimum of effort. Author (TAB)

N68-35942# Aerospace Medical Div. Aerospace Medical Research Labs. /6570th/, Wright-Patterson AFB, Ohio.
EFFECTS OF SIMULATED TASK LOADING ON SIDE-LOOKING RADAR TARGET RECOGNITION Final Report, Jan. 1966–Mar. 1967
Almon J. Bate and Herschel C. Self Jun. 1968 43 p refs
(AMRL-TR-67-141; AD-673873)

The study was conducted to determine the effects of simulated task loads that prevented observers from devoting all of their time to searching a radar display for targets of opportunity. Task loads taking up 0%, 25%, 50% and 75% of an observers screen viewing time during 30-minute trials were simulated by turning display on and off in a programmed random pattern. Forty SAC radar navigator-bombardiers were randomly assigned to the four viewing conditions. They viewed a 5-inch wide strip of high resolution, coherent SLR film projected on a 14-inch-square display screen. The radar picture, displayed at an image scale of 1:130,000, depicted a strip of terrain 25-nautical-miles wide and traveled from the top to the bottom of the screen at a simulated aircraft speed of 1300 knots, or 12.3 inches/minute. The number of correct responses and the number of false responses were approximately linear functions of accumulated viewing time. Mean distance traveled down the screen by targets and nontargets prior to responses was also significantly affected by viewing time, with the greatest increase in travel occurring when total viewing time was reduced from 75% to 50%. Since the numbers of correct and false responses decreased in approximately the same proportion with each decrease in viewing time, overall accuracy of responses was nearly constant for all viewing times. Author (TAB)

N68-35943# Battelle Memorial Inst., Columbus, Ohio.
CARBON DIOXIDE REDUCTION AND WATER ELECTROLYSIS SYSTEM Final Report, 1 Feb. 1966–30 Sep. 1967
Byung C. Kim, Edwin S. Kolic, Robert H. Cherry, and John E. Clifford May 1968 83 p refs
(Contract AF 33(615)-3444)
(AMRL-TR-67-227; AD-673903)

An integrated system for oxygen recovery from carbon dioxide was investigated as a breadboard laboratory model of nominal 1/2-man capacity. System design for carbon dioxide reduction was based on alternate operation of two Bosch reactors with periodic cool down for removal of carbon and replenishment of catalyst. Experimental studies demonstrated attainment of the design objectives of a carbon-to-catalyst ratio above 20 and an overall carbon-packing density of 0.45 g/cu.cm. in the catalyst chamber. Degradation of Bosch reactor materials during extended operation was a problem that was not completely resolved. Experimental studies indicated that a regenerable solid-adsorbent based on combinations of silica gel and molecular sieve operating on alternate cycles of absorption and desorption can be used for efficient transfer of water vapor from the Bosch recycle gas to a water-vapor electrolysis cell. The original matrix-type water-vapor electrolysis unit with Pd-25Ag hydrogen diffusion cathodes did not perform satisfactorily and was replaced by a water-vapor electrolysis unit with phosphoric acid electrolyte for satisfactory evaluation of water-vapor transfer for the integrated system. Author (TAB)

N68-35945# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
EFFECT OF AN AUXILIARY MAGNIFICATION DISPLAY ON SIDE-LOOKING RADAR TARGET RECOGNITION Final Report, Jan. 1966–Mar. 1967
Almon J. Bate and Herschel C. Self May 1968 45 p refs
(AMRL-TR-67-134; AD-673872)

Research was undertaken to determine if an auxiliary magnified display would aid radar-reconnaissance operators in recognizing unbriefed targets. Two identical parallel-driven side-looking radar films were presented on a dual-screen rear projection console to 36 radar navigator-bombardiers from the Strategic Air Command. Subjects assigned to the control group viewed imagery on a 7-inch square main screen. Subjects assigned to each of the three treatment groups used a cross-hair location device, which permitted any portion of the imagery on the main screen to be presented on an upper 7-inch-square auxiliary screen, at 2x, 4x, or 8x magnification. The imagery traveled from the top to the bottom of the main screen at a simulated aircraft speed of 658 knots, depicting, at a scale of 1:417,000, a strip of terrain 40 nautical miles wide. Providing an auxiliary magnification display had no beneficial effect upon the number of targets correctly recognized, the number on nontargets mistaken for targets, the proportion of responses that were made to real targets, or upon response latency. Author (TAB)

N68-35953# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
THE ASSESSMENT OF SKIN DOSE AND THE DEVELOPMENT OF THE SURVEY METER TYPE BP3
T. S. Playle and W. N. Walker May 1968 23 p refs
(RD/B/N-1107)

The criteria involved in the measurement of dose to the skin are reviewed, and the relevant characteristics of several types of radiation detectors which might be used in a portable survey meter for estimating this hazard are compared. A description is given of an instrument based on a shallow ionization chamber which was designed and built for this purpose; it incorporates a field effect transistor electrometer which provides a logarithmic response over the range 50 mRem hr^{-1} to 500 Rem hr^{-1} Author (NSA)

N68-35959# Naval Research Lab., Washington, D. C.
THERMOLUMINESCENT DOSIMETERS FOR PERSONNEL MONITORING
F. H. Attix, F. J. West, A. E. Nash, S. G. Grobics, and T. L. Johnson [1968] 11 p refs
(TID-24522) CFSTI: HC $3.00/MF $0.65

A number of thermoluminescent phosphors are suitable for application in personnel radiation monitoring. The principal characteristics of LiF (TLD 100), CaF_2:Mn, CaF_2 (fluorite), $Li_2B_4O_7$:Mn, $CaSO_4$:Mn, and BeO are summarized. Some useful dosimeter configurations are also discussed, including a new NRL dualphosphor design that is capable of measuring the X-ray or gamma-ray effective energy as well as the exposure or dose. Relative performance results for CaF_2:Mn dosimeters versus film badges are also included. Author (NSA)

N68-35963# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
MATHEMATICAL MODELS OF HUMAN PERFORMANCE IN MAN-MACHINE SYSTEMS Final Report, Apr.–Dec. 1967
Donald A. Topmiller May 1968 21 p refs Presented to the NATO Sci. Advisory Group Symp. on the Simulation of Human Behavior, Paris, Jul. 1967
(AMRL-TR-68-22; AD-673348)

The report describes three research approaches to the problem of mathematically representing human performance parameters in weapon, maintenance, and command and control systems. In the

first approach, twenty operations research analyses and models of military systems were examined to determine if the models included human factors parameters and to what extent they were sensitive to variations in these parameters. Although many of the functions of the systems modeled were performed by humans, human performance parameters were not, in general, sufficiently defined to permit mathematical or empirical manipulation within a man–machine simulation framework. In the second approach, an attempt was made to establish predictive relationships, based on regression and factor analysis techniques, between human engineering design parameters and those criteria of systems effectiveness, such as maintenance task time, that can be transformed into a more molar index-system downtime. The human engineering predictor-parameters accounted for 50% of the criterion variance. In the third approach, a series of experiments involving real-time simulation of a command and control system was conducted to determine if, and how, a computer might aid diagnostic performance (in tactical decision making) in threat evaluations. The system output or criterion of effectiveness was the degree to which the system assesses the true state of threat. With computer aiding, correct decisions increased by 13%. Author (TAB)

N68-35966# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.

CIRCADIAN RHYTHMS AND THE EFFECTS OF LONG DISTANCE FLIGHTS

Stanley R. Mohler, J. Robert Dille, and Harry L. Gibbons Apr. 1968 9 p refs Presented at Am. Public Health Assoc. Meeting, Miami Beach, Fla., 23–27 Oct. 1967

(AM-68-8; AD-672898)

Air travelers crossing four or more time zones experience significant desynchronization of certain daily biologic rhythms. Until rephasing of the rhythms occurs relative to the solar cycle at the destination, some subjective discomfort and disruption of psychophysiologic responses can occur. This paper reviews research on diurnal rhythms, discusses the implications for aircrew and passengers, and makes recommendations for reducing the effects of time zone displacements. Author (TAB)

N68-35972# Joint Publications Research Service, Washington, D. C.

BIOELECTRICAL ACTIVITY OF THE HUMAN BRAIN UNDER CONDITIONS OF DEEP WATER DIVES

A. V. Turgina and I. A. Aleksandrov 19 Sep. 1968 6 p refs Transl. into ENGLISH from Voyenno-Med. Zh. (Moscow), no. 8 p 47–50

(JPRS-46460)

Increase in irritability of the nerve cells of the brain is reported during dives to depths of 160 meters or more, but the intensive excitation process that developed lasted for only 1 to 4 minutes after exposure to such underwater depths. The EKG's then maintained a stable state throughout the remainder of the underwater exposure, although recordings were usually above normal. The EKG recordings exhibited more pronounced excitation during decompression following return from the underwater stay; and biological activity was unstable throughout the decompression period. This was particularly pronounced for the frontal regions of the brain. It is noted, however, that this excitation did not limit the normal activity of the divers. M.W.R.

IAA ENTRIES

A68-40128 #
PSYCHOMOTOR REACTIONS OF MONKEYS DURING FLIGHTS ALONG A BALLISTIC CURVE [PSIKHOMOTORNYE REAKTSII OBEZ'IAN PRI POLETAKH PO BALLISTICHESKOI KRIVOI].
R. Grandpierre.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 3-7. In Russian.

Investigation of the response time of sensory motor reactions, the behavior of the myogenic tonus at rest and when reacting to a signal, and the precision of motions during flights along a ballistic curve. The test animals were cats, rats, and monkeys (Nemestrina). The tests were performed with a three-stage rocket. It was found that the state of the vegetative nervous system of the animals, in particular, the cardiac and respiration rhythms, was hardly affected by weightlessness, whereas the EEG data concerning the general behavior of the animals differed substantially from the normal. The EEGs of two monkeys were found to differ appreciably. V.P.

A68-40129 #
INFLUENCE OF BARBAMYL AND THE SOMATOTROPIC HORMONE ON MICE DURING PROLONGED HYPOKINESIA [DEISTVIE BARBAMILA I SOMATOTROPNOGO GORMONA NA MYSHEI PRI DLITEL'NOI GIPOKINEZII].
L. A. Kravchuk and V. G. Ovechkin.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 7-12. 18 refs. In Russian.

Discussion of a 35-day experiment in which mice under conditions of isolation and hypokinesia were exposed to intraperitoneal introduction of barbamyl alone and after a preliminary (4 to 8-hr intervals) introduction of the somatotropic hormone. It was found that the duration of medicamental sleep is abruptly increased in the latter case. This is attributed to the fact that the somatotropic hormone produces changes in the functional state of the nervous system (decreases its sensitivity). V.P.

A68-40130 #
INFLUENCE OF HYPEROXIA ON THE ORGANS OF THE THORAX OF WHITE RATS [VLIIANIE GIPEROKSII NA ORGANY GRUDNOI KLETKI BELYKH KRYS].
A. R. Mansurov, F. B. Babchinskii, I. G. Krasnykh, and L. A. Tiutin.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 12-15. 10 refs. In Russian.

Investigation of the pathological changes developing in the respiratory and cardiovascular systems of white rats as a result of exposure to various levels of hyperoxia. It is found that the pathological changes observed are directly associated with the oxygen pressure in the gas system and the duration of exposures to this medium. V.P.

A68-40131 #
STABILIZATION OF THE CONCENTRATION OF MINERAL NUTRITION ELEMENTS DURING PROLONGED CHLORELLA CULTIVATION WITH MEDIUM RECYCLING [STABILIZATSIIA KONTSENTRATSII ELEMENTOV MINERAL'NOGO PITANIIA PRI DLITEL'NOM KUL'TIVIROVANII KHLORELLY S VOZVRATOM SREDY].
E. K. Lebedeva, G. I. Meleshko, T. B. Galkina, and N. N. Egorova.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 16-23. 5 refs. In Russian.

Experimental investigation showing that the concentration of such elements as N, P, S, Mg, K, and Fe can be maintained at a constant level with the aid of additions of a correcting solution with a composition devised to meet the requirements of the cells of these elements. The solution was added to the medium in portions matched to the amount by which the biomass increased. Small fluctuations in the concentration of the elements observed are attributed to structural changes in the algal population responsible for changes in the cell metabolism. V.P.

A68-40132 #
INVESTIGATION OF A CATALYTIC OXIDATION METHOD OF MINERALIZING WASTES IN THE BIOLOGICAL CYCLE [ISSLEDOVANIE OKISLITEL'NO-KATALITICHESKOGO METODA MINERALIZATSII OTKHODOV V SISTEME KRUGOVOROTA VESHCHESTV].
S. V. Chizhov, Iu. E. Siniak, V. V. Krasnoshchekov, B. G. Gusarov, S. O. Kuznetsov, I. V. Aleksandrova, and G. V. Ilgach.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 23-28. In Russian.

Investigation of a mineralization method based on pyrolytic decomposition of wastes and the oxidation of the pyrolysis products in the presence of a catalyst. The optimal parameters of the process are established experimentally. The optimum decomposition-zone temperature at atmospheric pressure is 450°C, while that of the catalytic oxidation zones lies between 250 and 300°C. Nutritive solutions of ash obtained from the wastes are evaluated from the biological standpoint. The mineralized products were found suitable for cultivating seaweed (Chlorella). V.P.

A68-40133 #
MATHEMATICAL MODEL OF A LIFE-SUPPORT SYSTEM [K MATEMATICHESKOI MODELI SISTEMY ZHIZNEOBESPECHENIIA].
V. A. Darg and B. G. Kovrov.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 28-33. 8 refs. In Russian.

Development of a mathematical model describing a partially closed biological cycle capable of regenerating part of the life-support products but requiring storage of the products that cannot be regenerated. The model incorporates an astronaut, a regenerating unit, a storage unit, and a unit which disposes of all products that are not required either by the astronaut or the regenerating unit. These components of the model are described mathematically with the aid of Makarov's theory of functions of a real variable. V.P.

A68-40134 #
DYNAMICS OF ORTHOSTATIC RESISTANCE OF SPORTSMEN UNDER THE INFLUENCE OF A 40-DAY HYPOKINESIA [DINAMIKA ORTOSTATICHESKOI USTOICHIVOSTI U SPORTSMENOV POD VLIIANIEM 40-SUTOCHNOI GIPOKINEZII].
A. V. Korobkov, L. A. Ioffe, M. A. Abrikosova, and Iu. M. Stoida.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 33-40. 16 refs. In Russian.

Investigation of the effect of a 40-day hypokinesia on the cardiovascular system of ten highly trained field-and-track athletes. The changes in the electrocardiograms, chronocardiograms, the tonus of elastic and muscular type vessels, and arterial pressure were studied. The results indicate that physical exercises involving training of the venous system are an effective means of increasing the orthostatic resistance of the human organism to the effects of weightlessness and hypokinesia. V.P.

A68-40135 #
DYNAMICS OF THE DIURNAL DIURESIS, CREATININE EXCRETION, AND MEAN THICKNESS OF THE CUTANEOUS FAT LAYER OF ATHLETES DURING PROLONGED HYPOKINESIA [DINAMIKA SUTOCHNOGO DIUREZA, EKSKRETSII KREATININA I SREDNEI TOLSHCHINY KOZHNOZHIROVOGO SLOIA U SPORTSMENOV V PROTSESSE DLITEL'NOI GIPOKINEZII].
A. A. Korobova and Iu. B. Vinichenko.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 40-43. 8 refs. In Russian.

Experimental investigation of the effect of hypokinesia on the dynamics of the metabolic processes in the muscular system of athletes on the basis of a comparison of the indices of diuresis, creatinine excretion, and thickness of the cutaneous fat layer. The difference in the mean values of creatinine excretion at the beginning and the end of the experiment was found to be statistically insignificant. The diuresis level decreased toward the end of the experiment,

while the thickness of the cutaneous fat layer increased. Small fluctuations in this thickness and in the creatinine excretion are attributed to a reduction in protein synthesis, enhancement of decomposition processes, and to partial replacement of muscular tissue by fat tissue. The decrease in diurnal diuresis during the course of the experiment is attributed to changes in the fat metabolism and to the Gauer-Henry reflex. V.P.

A68-40136 #
INFLUENCE OF PROLONGED BED REST ON THE MYOGENIC TONUS AND PROPRIOCEPTIVE REFLEXES OF HEALTHY HUMAN SUBJECTS [VLIIANIE DLITEL'NOGO POSTEL'NOGO REZHIMA NA MYSHECHNYI TONUS I PROPRIOTSEPTIVNYE REFLEKSY ZDOROVOGO CHELOVEKA].
M. A. Cherepakhin.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 43-47. 11 refs. In Russian.

Discussion of a 62-day experiment aimed at determining the effects of bed rest on the myogenic tonus and proprioceptive reflexes of man. One group of test subjects was confined to absolute bed rest, while another group performed physical exercises in a horizontal position for 15 to 45 min in the morning and from 1 to 2 hr in the afternoon. A decrease in the myogenic tonus was observed in all cases but was more pronounced in cases where no exercises were performed. The decrease in myogenic tonus had no effect on the proprioceptive reflexes. V.P.

A68-40137 #
INFLUENCE OF HYPOKINESIA ON HUMAN BLOOD CIRCULATION [VLIIANIE GIPOKINEZII NA KROVOOBRASHCHENIE CHELOVEKA].
V. S. Georgievskii and V. M. Mikhailov.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 48-51. 11 refs. In Russian.

Investigation of the combined effect of prolonged bed rest and preliminary exposure to accelerations on human blood circulation by mechanocardiographic and polycardiographic techniques. Tests performed on healthy male subjects showed that the heart rate and arterial blood pressure increased, the nature of these changes corresponding to the phases characteristic of the reactions of the cardiovascular system to weightlessness. A development of orthostatic hypotension was also noted. V.P.

A68-40138 #
NEUROLOGICAL CHANGES IN HEALTHY MEN SUBJECTED TO TWO MONTHS OF HYPOKINESIA [NEVROLOGICHESKIE IZMENENIIA U ZDOROVYKH LIUDEI, VYZYVAEMYE DVUKHMESIACHNOI GIPOKINEZIEI].
Iu. N. Purakhin and B. N. Petukhov.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 51-56. 10 refs. In Russian.

Evaluation of tests performed on six healthy men who were twice subjected to accelerations followed by 62-day bed rest, during which time three of the test subjects performed certain physical exercises. The study included tests of the systems, EEG recordings, and recordings of physiological tremors and fluctuations of the body gravity centers (stabilography) of the subjects. During the first two weeks of the experiment, the test subjects exhibited symptoms of asthenic reactions in their behavior and nervous systems. Later on, these symptoms became more pronounced; they acquired the form of neurological symptoms and of asthenic syndromes (neurasthenia). An analysis of the tremor data, the EEG recordings, and the stabilography indicated the development of changes in the central nervous system, in the autonomic nervous system, and in the orthostatic tolerance in response to long-term hypokinesia. Functional shifts were accompanied by morphological changes of the muscular system. P.v.T.

A68-40139 #
ARTERIAL TONE IN RELATION TO A LIMITATION OF HUMAN MUSCULAR ACTIVITY [ARTERIAL'NYI TONUS V SVIAZI S OGRANICHENIEM MYSHECHNOI DEIATEL'NOSTI CHELOVEKA].
N. E. Panferova and V. A. Tishler.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 56-62. 19 refs. In Russian.

Study of the arterial tone of sixteen test subjects prior to, during, and following a 5- to 20-day exposure to hypodynamics or relative physiological rest (on a chair or bed). Recordings were made of the velocity of the pulse-wave distribution in the aorta and in the arm and leg vessels, the calibrated pulse amplitude of vessels of the second and fourth fingers and of the toes (mm^3), the skin temperature of the chest, the forehead, the back of the hand, a foot and the front part of the skin was measured. Before and after the experiment, the test subjects underwent orthostatic tilt-table tests for a period of 15 to 20 min, during which time the above-mentioned indices were recorded. It was shown that the hypodynamics resulted in an increased constriction of the vessels of the lower extremities, including the skin arterioles, while the tone of the aorta and of the arm vessels remained practically unchanged. The constriction of the leg vessels was more pronounced during the postexperimental orthostatic tests as compared with the constriction observed during the preexperimental tests. P.v.T.

A68-40140 #
THE CONCEPT OF THE INDIVIDUAL AND ENVIRONMENT IN EXPERIMENTAL SPACE PSYCHONEUROLOGY [KONTSEPTSIIA "LICHNOST' I SREDA SUSHCHESTVOVANIIA" V EKSPERIMENTAL'NOI KOSMICHESKOI PSIKHONEVROLOGII].
O. N. Kuznetsov.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 62-70. 29 refs. In Russian.

Study of human adaptation to a variety of environments, with special emphasis on the technique of experimental space psychoneurology and its role in psychoneurological examinations of human behavior during space missions. Unusual psychic states and psychopathological syndromes exhibited by test subjects during anechoic-chamber experiments are compiled in tables. Diagnoses are made to explain these peculiar environmental effects. Based on literature data and on the findings of the author, human peculiarities in adapting to a variety of environments are discussed. It is shown that an extended enclosure of a test subject in a one-man anechoic-chamber offers a promising method for the study of human behavior characteristics. P.v.T.

A68-40141 #
MECHANISMS OF THE EFFECT OF INTENSE LIGHT STIMULI ON THE OPTIC ANALYSOR [K VOPROSU O MEKHANIZMAKH VOZDEISTVIIA INTENSIVNYKH SVETOVYKH RAZDRAZHITELEI NA ZRITEL'NYI ANALIZATOR].
V. I. Shostak.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 70-73. 10 refs. In Russian.

Determination of the recovery of the light intensity and of the electroretinogram b-wave component after an experimental flash (duration, 2.1 msec; luminosity, 7.8×10^7 nits) during the course of the subsequent dark adaptation. The two values show a close correlation, giving evidence of peripheral processes in dark-adaptation mechanisms. On the basis of a two-stage regression curve obtained, two regression equations for different phases of dark adaptation were derived. The dark-adaptation curve traced with the aid of these equations shows the possibility of using equations of this kind for an objective determination of light sensitivity and for an expression of the dark-adaptation process. P.v.T.

A68-40142 #
LIMITS OF HUMAN TOLERANCE TO LOCAL INFRARED IRRADIATION [PREDELY PERENOSIMOSTI CHELOVEKOM INFRAKRASNOI RADIATSII PRI MESTNOM OBLUCHENII].
I. I. Dedenko, N. K. Gnoevaia, and V. S. Ivanov.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 73-77. 5 refs. In Russian.

Attempt to establish quantitative indices of human tolerance to IR irradiation. The intensity of the irradiation is taken into account. The body areas exposed in these experiments were the forearms of the test subjects. A total of 169 tests were made on sixteen test subjects. As soon as the test subjects felt an intolerable pain, the experimentation was stopped. In some experiments, up to 210 cm^2 of the surface of the skin was exposed. The results are

summarized in table form. It was found that the pain threshold does not depend on the absolute value of the skin temperature, but on the rate of its increase. The higher the irradiation intensity becomes, the lower is the absolute temperature at which a feeling of intolerable pain appears. P.v.T.

A68-40143 #
EFFECT OF A VEGETABLE DIET INCLUDING A BIOMASS OF UNICELLULAR ALGAE ON THE EXCRETION AND BALANCE OF MINERAL ELEMENTS [VLIIANIE RASTITEL'NOI DIETY, VKLIUCHAIUSHCHEI BIOMASSU ODNOKLETOCHNYKH VODOROSLEI, NA VYDELENIE I BALANS MINERAL'NYKH ELEMENTOV].
E. I. Pokrovskaia, A. P. Tereshchenko, and V. M. Volynets.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 78-81. 10 refs. In Russian.

Evaluation of a 30-day experiment performed on five healthy male subjects, demonstrating that vegetable diets including about 210 g of dry Chlorella biomass decrease the assimilation of calcium and magnesium and produce an insignificant negative balance of these elements between the twentieth and the thirtieth day. The assimilation of potassium and phosphorus undergoes no change, and their balance remains positive throughout the experiment. P.v.T.

A68-40144 #
EVAPORATION UNDER LOW ATMOSPHERIC PRESSURE CONDITIONS [VLAGOPOTERI V USLOVIIAKH PONIZHENNOGO ATMOSFERNOGO DAVLENIIA].
I. N. Cherniakov, I. V. Maksimov, and P. Ia. Azhevskii.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 81-86. 12 refs. In Russian.

Study of moisture losses of men wearing a partial pressure suit with an oxygen mask. The evaporation losses were determined by the changes in the skin temperature and heat flow, measured with the aid of a special device. The experiments were performed at altitudes of 20,000 m and above. Evaporation occurred from body portions covered by the pressurized suit. The evaporation decreased the skin temperature, increased the heat flow, and caused a feeling of cold in the test subjects. Vacuum evaporation results from a decrease in atmospheric pressure to the saturated-vapor elasticity value at skin temperature, and from body surfaces contacting with the ambient atmosphere through the underwear and suit pores. Human water losses through vacuum evaporation at altitudes of 20,000 m and above, at comfortable temperatures, and at rest amount to 100 g/hr, thus remaining below the danger limit. Under the above and under normal conditions, water losses depend mainly on the body heat exchange. P.v.T.

A68-40145 #
VARIATION PULSOGRAMS AND INDICES OF THE EXTERNAL RESPIRATION FUNCTION DURING HUMAN EXPOSURE TO ACUTE HYPOXIA [VARIATSIONNYE PUL'SOGRAMMY I POKAZATELI FUNKTSII VNESHNEGO DYKHANIIA PRI DEISTVII NA ORGANIZM CHELOVEKA OSTROI GIPOKSII].
I. R. Kalinichenko and G. A. Nikulina.
Kosmicheskaia Biologiia i Meditsina, vol. 2, May-June 1968, p. 87-90. 7 refs. In Russian.

Study of the physiology of humans exposed to acute hypoxia, with the aid of variation pulsograms. Six helathy male subjects were enclosed for two hours at an altitude of 5000 m without an additional oxygen supply. Indices on the function of external respiration and pulmonary gas exchange served as additional informative data. The measurements were carried out on the test subjects after they had been exposed for 36 hr to a changed work-and-rest cycle. The results of the experiments show that the state of health of humans exposed to acute hypoxia can be determined by variation pulsograms. P.v.T.

A68-40286 *
DAILY RHYTHM IN THE NORADRENALINE CONTENT OF RAT HYPOTHALAMUS.
James Manshardt and Richard J. Wurtman (Massachusetts Institute of Technology, Dept. of Nutrition and Food Science, Cambridge, Mass.).
Nature, vol. 217, Feb. 10, 1968, p. 574, 575. 10 refs.
PHS-supported research; Grant No. NGR-22-009-272.

Description of three experiments using female Sprague-Dawley rats to determine the daily rhythm in the noradrenaline content of the rat hypothalamus. Significant daily rhythms were observed in both the anterior hypothalamus and the posterior hypothalamus. The noradrenaline contents of both regions were greatest at the middle of the daily dark period. In the anteior hypothalamus, the catecholamine concentration was low throughout the light period; in the posterior hypothalamus, the nadir was reached at the end of the dark period. In both regions, the magnitude of the change was 22 to 24%. R.M.

A68-40287 *
FORMATION OF MELATONIN AND 5-HYDROXY-INDOLE ACETIC ACID FROM ^{14}C-TRYPTOPHAN BY RAT PINEAL GLANDS IN ORGAN CULTURE.
Richard J. Wurtman, Frances Larin (Massachusetts Institute of Technology, Dept. of Nutrition and Food Science, Cambridge, Mass.), Julius Axelrod (National Institutes of Health, National Institute of Mental Health, Laboratory of Clinical Science, Bethesda, Md.), Harvey M. Shein, and Katherine Rosasco (McLean Hospital, *Research Laboratories, Belmont; Harvard University,* Harvard Medical School, Dept. of Psychiatry, Boston, Mass.).
Nature, vol. 217, Mar. 9, 1968, p. 953, 954. 10 refs.
PHS-supported research; Grant No. NGR-22-009-272.

Description of an experiment, where pineal glands of rats were incubated with ^{14}C-tryptophan (10^{-4} M, 460,000 cpm) or ^{14}C-5-hydroxytryptophan (2.5×10^{-4} M, 460,000 cpm) for two days. In all conditions studied, considerable amounts of serotonin, melatonin and 5HIAA were formed. The development of an in vitro system offers a possibility of studying the biochemical mechanism by which nerve impulses control pineal parenchymal function and might also provide a relatively simple mechanism for testing the effects of drugs and hormones on the biosynthesis of serotonin and related compounds. R.M.

A68-40289 *
DAILY RHYTHM IN TYROSINE CONCENTRATION IN HUMAN PLASMA - PERSISTENCE ON LOW-PROTEIN DIETS.
Richard J. Wurtman, Chuan Chou, and Christopher M. Rose (Massachusetts Institute of Technology, Dept. of Nutrition and Food Science, Cambridge, Mass.).
Science, vol. 158, Nov. 3, 1967, p. 660-662. 12 refs.
PHS Grants No. AM-11709; No. AM-11237; No. FR 88; Contract No. AF 41(609)-3151; Grant No. NGR-22-009-272.

Observation of the concentration of tyrosine in the plasma of normal human males. This concentration varies diurnally. It is lowest (9.5 ± 0.35 μg/ml) between 0130 and 0230 hours and rises to a peak of 16.2 ± 0.82 μg/ml by 1030 hours. This rhythm is found to persist when the subjects are maintained for two weeks on a diet that is very low in protein. R.M.

A68-40301
ELECTRONIC SYNTHESIS OF THE AVIAN RETINA.
Ronald G. Runge (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Astropower Laboratory, Electronics Laboratory, Newport Beach, Calif.), Mas Uemura (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Astropower Laboratory, Newport Beach, Calif.), and Sam S. Viglione (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Astropower Laboratory, Electronics Research Dept., Newport Beach, Calif.).
IEEE Transactions on Bio-Medical Engineering, vol. BME-15, July 1968, p. 138-151. 16 refs.
Research supported by the McDonnell Douglas Corp.; Contract No. AF 33(615)-3726.

An electronic model, based on reported physiological and anatomical findings and capable of replicating the optical-to-electrical transformations performed by the avian retina, has been constructed. The purpose for the development of the model is briefly discussed. A review of the pertinent physiological and anatomical investigations upon which the model is based is presented. The techniques used for electronically modeling the six functional classes

of ganglion detectors of the pigeon retina are described. The development of the model has demonstrated that the complex data processing of the retina can be electronically synthesized. In construction of the model it has been necessary to clearly define the performance and interconnection arrangement of each anatomically distinct neuron of the retina; hence, the model presents a postulate for the theory of operation of cone retinas with scotopic stimuli. (Author)

A68-40302 *

TEMPORAL STABILITY AND INDIVIDUAL DIFFERENCES IN THE HUMAN EEG - AN ANALYSIS OF VARIANCE OF SPECTRAL VALUES.

Jan Berkhout and Donald O. Walter (California, University, Brain Research Institute, Space Biology Laboratory, Los Angeles, Calif.).

IEEE Transactions on Bio-Medical Engineering, vol. BME-15, July 1968, p. 165-168. 8 refs.

Contracts No. Nonr-233(91); No. NAS 9-1970; NIH Grant No. FR-3; PHS Grant No. NB 02501.

Normalized power spectra were determined for each of a series of thirty 5 and 10 sec epochs of eight-channel EEG recordings, taken from 47 subjects under conditions of rest and perceptual task stress. The data thus obtained were evaluated by an analysis of variance to determine their dispersion characteristics. In the eyes-closed resting case, all channels and frequencies demonstrated statistically significant spectral differences between individuals, when compared to the dispersion of values within individuals. The temporal stability of the EEG was itself a significant factor in discriminating individuals. During performance of a visual task, spectral individuality was greatly decreased in the frontal-temporal region, while maintained in the parieto-occipital area. Distinctive behavior of certain specific frequencies was noted. (Author)

A68-40325 #

MEDICAL EVALUATION OF ASTRONAUTS AND USAF TEST PILOTS.

Timothy N. Caris (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).

Air University Review, vol. 19, July-Aug. 1968, p. 6-15.

Examination of the biological capacity of the special mission pilots. The techniques of diagnosing the coronary heart disease are detailed. Circumstances which can lead to a drop in blood circulation (followed by loss of consciousness) are noted. The importance of detecting early stages of diabetes, epilepsy, brain tumor, blood vessel disease, and brain scarring from previous injury or infection, is discussed. Z. W.

A68-40326 #

TOXICOLOGY CONSIDERATION IN EXTENDED AEROSPACE FLIGHT.

A. A. Thomas (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Toxic Hazards Div., Wright-Patterson AFB, Ohio).

Air University Review, vol. 19, July-Aug. 1968, p. 16-27.

Discussion on chemical hazards which can affect the health of aerospace crews. The operational implications of toxic hazards for the design of spacecraft for manned mission durations of 100 to 1000 days are discussed. It is necessary to consider the problems of adapting the human organism to the new environment of the spacecraft with its artificial atmosphere and then readapting to normal conditions. The dangers of prolonged exposure of the organism to the action of trace contaminants in the artificial atmosphere are emphasized. It is stressed that trace contaminants affect all vital organ functions and that classes of contaminants having different target organs or modes of action can exert additive and even synergistic toxic effects. Many organic compounds do have a depressive effect on the central nervous system. The philosophy of contamination control, the selection of materials, the need for established tolerance limits for humans, and the in-flight control of contaminants in the cabin are discussed. Z. W.

A68-40327 #

THE PHYSIOLOGICAL CLOCK ACROSS TIME ZONES AND BEYOND.

Hubertus Strughold (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Aerospace Medical Center, Brooks AFB, Tex.).

Air University Review, vol. 19, July-Aug. 1968, p. 28-33. 16 refs.

Discussion of problems of regulating the sleep cycle during manned space missions. The nature of the physiological clock and its cyclic phases are outlined on the basis of the recent results of experimental studies. The stability and changeability of the physiological day-night cycle are discussed. The impact of physiological clock on desynchronization of the physical and physiological cycles in air travel and subsequent readaptation of the individual is described. In regard to space flight, astronauts must follow their internal clock in the arrangement of their sleep and activity regime. This cycle must be isochronous with their natural (inborn) day-night pattern and preferably synchronous with their home time zone. Z. W.

A68-40328 #

DEVELOPMENT OF AEROSPACE ESCAPE SYSTEMS.

James W. Brinkley (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).

Air University Review, vol. 19, July-Aug. 1968, p. 34-49. 12 refs.

Review of medical research in the development of aerospace escape systems. The evolution of escape systems from the ballistically catapulted crew seat to the rocket-propelled cockpit is described. Techniques providing estimates of human tolerance to the ejection-seat acceleration, deceleration, and windblast are discussed. Particularly treated is the use of analogs (mechanical systems composed of elements analogous to the mass, elasticity, and damping properties of the human body) to (1) describe the human response to mechanical environments - e.g., the short-duration acceleration associated with ejection - and (2) provide a statistical method of predicting the injury potential. It is concluded that the analog provides also a powerful tool for the development of escape systems for space vehicles, but the fundamental biological properties that limit man's capability must be more precisely defined by an increased research effort if the analog is to be maximally useful. Z. W.

A68-40361 #

THE CONTROL SYSTEM FOR EYE MOVEMENTS - A SURVEY [SISTEMA UPRAVLENIIA DVIZHENIIAMI GLAZ - OBZOR].

A. I. Lauringson and N. G. Proskuriakova.

Avtomatika i Telemekhanika, July 1968, p. 72-85. 37 refs. In Russian.

Examination of the operation of the system which controls the movements of the eyes. The operation is considered for three cases: (1) fixation on a stationary point, (2) a change in the points of fixation, or the following of a discretely moving target, and (3) the following of a continuously moving target. An electrooculographic method is used to study the potential of the eye impulses. The role of eye fixation movements in visual perception is discussed. M. G.

A68-40362 #

CONTROL OF ONE MUSCLE AND OF A PAIR OF ANTAGONIST MUSCLES UNDER ACCURATE SEARCH CONDITIONS [UPRAVLENIE ODNOI MYSHTSEI I PAROI MYSHTS-ANTAGONISTOV V USLOVIIAKH TOCHNOSTNOGO POISKA].

V. I. Chernov.

Avtomatika i Telemekhanika, July 1968, p. 86-100. In Russian.

Results of an experimental investigation of the process of maintaining a fixed stress of a muscle, and the processes of controlling a pair of antagonist muscles. The control of the pair of muscles was studied under the condition of maintaining a fixed joint angle or under the condition of maintaining the highest frequency of joint-angle changes. The results satisfy the model motions of the simplest searching mechanism suggested by Aizerman and Andreeva (1968). M. G.

A68-40366 #

SOME BIOCHEMICAL PECULIARITIES OF THE COMBINED ACTION OF ULTRAVIOLET RAYS AND X RAYS ON AN ORGANISM

[DEIAKI BIOKHIMICHNI OSOBLIVOSTI SUMISNOI DII NA ORGANIZM UL'TRAFIOLETOVIKH I RENTGENIVS'KIKH PROMENIV].
V. A. Baraboi, L. I. Zagoruiko, L. M. Ostrits'ka, and V. Iu. Fialek (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Viddil Tkaninnoi Dozimetrii, Kiev, Ukrainian SSR).
Fiziologichnii Zhurnal, vol. 14, July-Aug. 1968, p. 504-513. 36 refs. In Ukrainian.

Study of the changes in glucose content, blood cholinesterase activity, and the excretion of 17-oxycorticosteroids in the urea of guinea pigs in order to determine the preventive effects of UV irradiation on the lethal effects of X rays. It is established that the repeated use of UV rays affects the reaction of a mammalian organism in such a way that a more quiet, slower, and less manifested reaction to the X-ray lethal dose is observed. This slower reaction is noted in the form of hyperglycemia, a cholinesterase activity decrease, and an excretion of corticosteroids. M.G.

A68-40367 #
COMPUTER PROGRAMING AND SOLUTION OF THE PROBLEM OF DETERMINING THE PARAMETERS OF THE OXYGEN REGIME OF AN ORGANISM [PROGRAMUVANNIA TA ROZV'IAZANNIA ZADACHI PO OBCHISLENNIU PARAMETRIV KISNEVIKH REZHIMIV ORGANIZMU NA ELEKTRONNO-OBCHISLIUVAL'NII MASHINI].
V. S. Mishchenko (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Viddil Vikovoi Fiziologii, Kiev, Ukrainian SSR).
Fiziologichnii Zhurnal, vol. 14, July-Aug. 1968, p. 563-568. 5 refs. In Ukrainian.

Discussion of a procedure for constructing a computer program for determining the characteristics of the oxygen activity and metabolism in the human organism. The program covers a large number of characteristics, including the respiratory volume, O_2 and CO_2 alveolar ventilation, the respiratory coefficient, the partial pressure of O_2 and CO_2 in the alveolar volume, the oxygen contents in arterial and venous blood and in the lungs, saturation of venous blood with oxygen, and the oxygen consumption rates. An extensive list of formulas used in the process is given. Computer-calculated numerical results are given for one test subject. V.Z.

A68-40379 #
HUMAN ERROR RESEARCH AND ANALYSIS PROGRAM (HERAP).
J. A. Mastropaolo, A. A. Burrows (McDonnell Douglas Corp., Douglas Aircraft Co., Aircraft Div., Long Beach, Calif.), R. E. Luehrs, and R. A. Alkov (U.S. Naval Aviation Safety Center, Behavioral Sciences Div., Aeromedical Dept., Norfolk, Va.).
(American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 4th, Anaheim, Calif., Oct. 23-27, 1967, Paper 67-848.)
Journal of Aircraft, vol. 5, Sept.-Oct. 1968, p. 497-501.
[For abstract see issue 24, page 4117, Accession no. A67-42984]

A68-40635
A NEW SIMULATION TECHNIQUE TO STUDY LUNAR SELF-LOCOMOTIVE TASKS.
Allwin E. Wudell and Don A. Lewis (Martin Marietta Corp., Aerospace Group, Denver, Colo.).
Journal of the Astronautical Sciences, vol. 15, May-June 1968, p. 148-152.

A new lunar simulation technique using a six-degree-of-freedom servo-driven moving base simulator is presented. The technique is to be used for evaluation of lunar self-locomotive tasks. A test subject is mounted on the movable head of the simulator and runs in place on a treadmill. Load cells are used to measure contact forces and moments, which, in turn, are fed to the equations of motion on a hybrid computer. Positional commands are then computed and used to properly position the moving base simulator. (Author)

A68-40835 *
VOCALIZATION EVOKED FROM FOREBRAIN IN MACACA MULATTA.
Bryan W. Robinson (National Institutes of Health, National Institute of Mental Health, Laboratory of Psychology, Bethesda, Md.).
Physiology and Behavior, vol. 2, 1967, p. 345-354. 57 refs.
NIH Grant No. FR-00165; Grant No. NGR-11-001-012.

Electrical stimulation of 5880 loci in the forebrain of unanesthetized M. mulatta was undertaken. Vocalization occurred from 479 of these loci. The loci responsible were primarily in the limbic system and were located in the anterior cingulate gyrus, amygdala, diagonal band-substantia innominata, anterior perforated area, stria terminalis, ventral septum, preoptic areas, all portions of the hypothalamus, nuc. accumbens, nuc. ventralis anterior and midline nucleus of the thalamus, zona incerta, and tegmentum. Virtually every type of described vocalization was elicited. Such different types of vocalization were not randomly distributed in this system but often specific vocalizations occurred in definite loci. Measures of response probability and response distribution indicated no single prepotent zone for this response. The results were discussed in relation to the evolution of human speech. (Author)

A68-40898 *
PILOT RESPONSE IN COMBINED CONTROL TASKS.
Hugh P. Bergeron (NASA, Langley Research Center, Space Mechanics Div., Hampton, Va.).
Human Factors, vol. 10, June 1968, p. 277-282.

Investigation of pilot response in a multitask simulation, which consisted of a primary control task combined with one or two secondary or side-control tasks. A general description of the response characteristics of each of these tasks was obtained, and this information was used to determine the work-load requirements of the tasks. Two different control tasks were used as the primary control task, either a fixed-base simulation of a lunar letdown or a simplified multiloop tracking task which was similar to the end portion of the lunar letdown. The simplified tracking task was used in lieu of the more complicated lunar letdown, because it could be represented and reproduced analytically. The secondary or side tasks consisted of a system-failures task and a motor-response task. The system-failures task was incorporated from those systems present in a vehicle known as the Mercury Procedures Trainer. The pilot's capability in controlling the multitask simulation was evaluated, and the intertask correlation was determined. It was found that either of the two side tasks produced similar effects on the primary task. Quality measurements were made of all three tasks in all possible combinations. The degradation of each, when in the combined task tests, was then correlated to the other tasks of the same test. A simple relationship was found for predicting the time required of a human operator to perform the particular tasks in question. This relationship could be used to determine the workloading qualities of the tasks when performed either alone or combined. M.M.

A68-40966
AN AEROMEDICAL ELECTRONIC STETHOSCOPE.
J. A. Mastropaolo (McDonnell Douglas Corp., Long Beach, Calif.).
IN: THE CONFERENCE RECORD; INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, REGION SIX CONFERENCE, PORTLAND, ORE., MAY 20-22, 1968, PROCEEDINGS. [A68-40962 21-11]
Conference sponsored by the Portland Section of the Institute of Electrical and Electronics Engineers.
Portland, Ore., Institute of Electrical and Electronics Engineers, Inc., 1968. 4 p.

Monitoring vital signs in aeromedical evacuation aircraft is handicapped because heart, blood pressure, and respiratory sounds are considered inaudible with the ordinary stethoscope. An electronic stethoscope, the MC-9A, was designed to overcome this shortcoming. The appearance of the MC-9A is different from an ordinary stethoscope mainly at the "T" junction where the battery and amplifier are encased in a housing 3-3/4 in. long by 1/2 in. to 7/8 in. in diam. Heart and blood pressure signals with the MC-9A were judged good by three physicians and three nurses. Respiratory sounds were judged of doubtful diagnostic significance by one physician. The data suggest that valid sphygmomanometric blood pressures are possible because the first and last sounds are audible. The MC-9A was judged adequate in two different types of aeromedical evacuation aircraft, suggesting that it is a generalized solution rather than one specific to a particular aircraft. Under

load conditions, frequency response data suggest greater fidelity than that obtainable with a common stethoscope. Medical acceptance seemed good. (Author)

A68-41079
WORK SCHEDULES AND PERFORMANCE DURING CONFINEMENT.
W. Dean Chiles (Federal Aviation Administration, Civil Aeromedical Research Institute, Psychology Laboratory, Oklahoma City, Okla.), Earl A. Alluisi (Louisville, University, Dept. of Psychology, Louisville, Ky.), and Oscar S. Adams (Lockheed Aircraft Corp., Lockheed-Georgia Co., Operations Research Div., Marietta, Ga.).
Human Factors, vol. 10, Apr. 1968, p. 143-195. 28 refs.
Contracts No. AF 33(616)-3745; No. AF 33(616)-6050; No. AF 33(616)-7607; No. AF 33(657)-10506.

Thirteen investigations were carried out as a part of an eight-year program of research on the performance effects of various work/rest schedules during confinement to a simulated aerospace vehicle crew compartment. A total of 139 subjects was tested using standard performance tasks. The synthetic work approach used provided a reliable, face-valid, and sensitive technique for assessing complex operator performance. It was found that a man can work 12 hr/day on a 4-hr work/4-hr rest schedule for periods of at least 30 days. For shorter periods, a man can work 16 hr/day on a 4/2 schedule, but at a significant cost to his reserves for meeting emergencies such as sleep loss. Circadian periodicities are found in psychophysiological functions paralleled by similar periodicities in performance functions, the latter being subject to modification by special motivational instructions. (Author)

A68-41080
MAN-MACHINE EFFECTIVENESS ANALYSIS; HUMAN FACTORS SOCIETY, ANNUAL SYMPOSIUM, 4TH, UNIVERSITY OF CALIFORNIA, LOS ANGELES, CALIF., JUNE 15, 1967, PROCEEDINGS.
Symposium supported by the Human Factors Society, the University of California, and North American Aviation.
Edited by R. E. Blanchard (Dunlap and Associates, Inc.) and D. H. Harris (North American Rockwell Corp., Aerospace and Systems Group, Autonetics Div., Downey, Calif.).
North Hollywood, Calif., Western Periodicals Co., 1968. 88 p. $9.50.

CONTENTS:

A68-41082 #
DEPENDENT MODELS FOR ESTIMATING HUMAN PERFORMANCE RELIABILITY.
Herman L. Williams (Martin Marietta Corp., Baltimore, Md.).
IN: MAN-MACHINE EFFECTIVENESS ANALYSIS; HUMAN FACTORS SOCIETY, ANNUAL SYMPOSIUM, 4TH, UNIVERSITY OF CALIFORNIA, LOS ANGELES, CALIF., JUNE 15, 1967, PROCEEDINGS. [A68-41080 21-05]
Symposium supported by the Human Factors Society, the University of California, and North American Aviation.
Edited by R. E. Blanchard and D. H. Harris.
North Hollywood, Calif., Western Periodicals Co., 1968, p. 3-1 to 3-11.

Discussion of dependent relationships among steps in a task performed by the same operator or by operators working together, which make it necessary to use conditional probabilities in the model for computing human performance reliability. The value of the conditional probability for a given step depends not only on the characteristics of the equipment being operated and on the environment in which the step is performed, but also on the particular combination and characteristics of task steps preceding it in the operational sequence. Sources of probability data available now or likely to become available in the future can take equipment design features and the environment into account. The combination of characteristics of earlier task steps, however, usually is unique. Consequently, transition models are needed to bridge the gap between the marginal probabilities found in data stores and the conditional probabilities of dependent models for computing human performance reliability. F.R.L.

A68-41083 #
TOWARD A GENERAL CHARACTERIZATION OF ELECTRONIC TROUBLESHOOTING.
Anthony K. Mason and Joseph W. Rigney (Southern California, University, Electronics Personnel Research Group, Los Angeles, Calif.).
IN: MAN-MACHINE EFFECTIVENESS ANALYSIS; HUMAN FACTORS SOCIETY, ANNUAL SYMPOSIUM, 4TH, UNIVERSITY OF CALIFORNIA, LOS ANGELES, CALIF., JUNE 15, 1967, PROCEEDINGS. [A68-41080 21-05]
Symposium supported by the Human Factors Society, the University of California, and North American Aviation.
Edited by R. E. Blanchard and D. H. Harris.
North Hollywood, Calif., Western Periodicals Co., 1968, p. 4-1 to 4-11.
Contract No. Nonr-228(22).

Investigation of the resemblance of technician troubleshooting behavior to that of a Bayesian processor. In the course of the investigation, experiments were performed to compare the decisions reached by human technicians with those implied by the application of Bayes' theorem. Analysis of the data obtained from experiments indicated that, although the Bayesian model was reasonably predictive, it would be desirable to define a more generalized concept of a troubleshooting processor. Some preliminary suggestions for such a processor are presented and, in particular, one which accommodates certain categories of error in human electronic troubleshooting. F.R.L.

A68-41084 #
A PRAGMATIC APPROACH TO THE PREDICTION OF OPERATIONAL PERFORMANCE.
David Meister (Bunker-Ramo Corp., Canoga Park, Calif.).
IN: MAN-MACHINE EFFECTIVENESS ANALYSIS; HUMAN FACTORS SOCIETY, ANNUAL SYMPOSIUM, 4TH, UNIVERSITY OF CALIFORNIA, LOS ANGELES, CALIF., JUNE 15, 1967, PROCEEDINGS. [A68-41080 21-05]
Symposium supported by the Human Factors Society, the University of California, and North American Aviation.
Edited by R. E. Blanchard and D. H. Harris.
North Hollywood, Calif., Western Periodicals Co., 1968, p. 6-1 to 6-14. 6 refs.

Discussion of a pragmatic approach to the prediction of operational performance, which assumes that there is a conscious attempt to avoid mathematical models and theoretical internal behavioral processes in developing predictions of operator performance. These predictions assume that data can be generalized so that operator performance on equipment X can be used to predict operator performance on equipment Y if the two equipments and the two operator populations are similar. The emphasis in the pragmatic orientation is on data rather than theory, and the pragmatist attempts to maximize whatever he has. He recognizes that his predictions must involve or be organized around certain parameters which are assumed to be important to operator performance and are discussed. F. R. L.

A68-41085 #
MAN-MACHINE SIMULATION - THE PIMO APPLICATION.
Glenn Spencer (Serendipity Associates).
IN: MAN-MACHINE EFFECTIVENESS ANALYSIS; HUMAN FACTORS SOCIETY, ANNUAL SYMPOSIUM, 4TH, UNIVERSITY OF CALIFORNIA, LOS ANGELES, CALIF., JUNE 15, 1967, PROCEEDINGS. [A68-41080 21-05]
Symposium supported by the Human Factors Society, the University of California, and North American Aviation.
Edited by R. E. Blanchard and D. H. Harris.
North Hollywood, Calif., Western Periodicals Co., 1968, p. 7-1 to 7-12.

Discussion of a new approach to the presentation of the technical data used by maintenance technicians. This project, PIMO (Presentation of Information for Maintenance and Operation), has resulted in the development of an audio-visual approach to on-aircraft and in-shop maintenance information presentation. Specific attention is paid to the digital simulation model employed and to the types of maintenance variables of concern to the study. The object system for the current test phase is the C-141A jet cargo aircraft. The AMES (Aircraft Maintenance and Effectiveness Simulation) model was devised to relate changes in maintenance performance to changes in C-141A effectiveness. F. R. L.

A68-41086 #
MAN-MACHINE SYSTEM EVALUATION - THE NORMATIVE OPERATIONS REPORTING METHOD.
M. Stephen Sheldon and Henry J. Zagorski (System Development Corp., Santa Monica, Calif.).
IN: MAN-MACHINE EFFECTIVENESS ANALYSIS; HUMAN FACTORS SOCIETY, ANNUAL SYMPOSIUM, 4TH, UNIVERSITY OF CALIFORNIA, LOS ANGELES, CALIF., JUNE 15, 1967, PROCEEDINGS. [A68-41080 21-05]
Symposium supported by the Human Factors Society, the University of California, and North American Aviation.
Edited by R. E. Blanchard and D. H. Harris.
North Hollywood, Calif., Western Periodicals Co., 1968, p. 8-1 to 8-9.

Description of the Normative Operations Reporting Method (NORM), which is currently being applied in SAGE (Semi-Automatic Ground Environment) field evaluation. SAGE is described in sufficient detail to make possible some appreciation of the measurement and evaluation problems. The SAGE crew performance criterion development procedures are discussed. The development of the normative evaluation methodology is outlined in detail. An attempt is made to show the applicability of this methodology to other systems. The creativity of the method lies in the unique combination and application of assessment techniques that are well known. F. R. L.

A68-41216
AEROSOL SPRAY ELECTRODES FOR MEDICAL INSTRUMENTATION.
C. M. Hauser and Marlin S. Liles (Hauser Research and Engineering Co., Boulder, Colo.).
IN: ENERGISTIC MATERIALS: ENERGY TO THE BENEFIT OF AEROSPACE AND MANKIND; SOCIETY OF AEROSPACE MATERIAL AND PROCESS ENGINEERS, NATIONAL SYMPOSIUM AND EXHIBIT, 13TH, CHICAGO, ILL., MAY 7-9, 1968, PROCEEDINGS. [A68-41193 21-15]
North Hollywood, Calif., Western Periodicals Co. (SAMPE Science of Advanced Materials and Process Engineering Proceedings. Volume 13), 1968, p. 331-336.

Development of techniques for monitoring heart performance of test pilots and bomber pilots. A conductive metallic pigment with low particle density is the basis for an aerosol-spray conductive adhesive. The fast-drying adhesive bonds a fine wire to the body, forming an almost weightless electrode. The bond is so intimate that normal body movements do not cause artifacts or electrical noise. Other major advantages of this system, besides monitoring heart activity during active exercise, are reduction of body "noise" and base-line shifts due to physical activity. The electrodes can be applied and removed easily, and they are durable (having been used as long as 72 hr). P. v. T.

A68-41236 #
SELF-REGULATION AND SELF-OSCILLATIONS OF AN ENTROPY FLUX [SAMOREGULIUVANNIA I AVTOKOLIVANNIA POTOKU ENTROPII].
R. V. Beliakov (Kiivs'kii Institut Inzheneriv Tsivil'noi Aviatsii, Kiev, Ukrainian SSR).
Akademiia Nauk Ukrains'koi RSR, Dopovidi, Seriia A - Fiziko-Tekhnichni i Matematichni Nauki, vol. 30, July 1968, p. 641-644. 19 refs. In Ukrainian.

Critical analysis of the postulate of a thermodynamic steady state and of the concept of steady-state systems having constant entropy. A self-oscillatory system using a liquid chemical polymer as a working body is described briefly. An analysis of the operation of this system yields differential equations describing the self-regulated entropy flux in such systems. A condition is given under which stable entropy-flux pulsations may exist in such systems. V. Z.

A68-41725 *
SPACE CLINICAL MEDICINE - A PROSPECTIVE LOOK AT MEDICAL PROBLEMS FROM HAZARDS OF SPACE OPERATIONS.
Douglas E. Busby (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.).
Space Life Sciences, vol. 1, Aug. 1968, p. 157-427. 1178 refs. Contract No. NASr-115.

Description of the characteristics of medical problems arising from hazards of space operations, and suggestion of methods of managing these problems in space. Among the topics covered are (1) acute hypoxia, (2) the ebullism syndrome, (3) explosive decompression injuries, (4) decompression sickness, (5) aerotitis media and aerosinusitis, (6) heat disorders, including dehydration, (7) cold injury and hypothermia, (8) medical problems due to particle and droplet contamination of the spacecraft-cabin atmosphere, (9) urinary calculus, (10) medical implications of cardiovascular adaptions to weightlessness, (11) acute radiation effects, (12) injuries from meteoroid penetration, (13) burns, (14) injuries from mechanical forces, and (15) carbon dioxide toxicity. The pathophysiological characteristics of these problems are also discussed to provide the rationale for the prevention and treatment of such problems in space. R. M.

A68-41726 *
CONFINEMENT AND FREE-VOLUME REQUIREMENTS.
T. M. Fraser (Waterloo, University, Waterloo, Ontario, Canada; Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.).
Space Life Sciences, vol. 1, Aug. 1968, p. 428-466. 90 refs. Contract No. NASr-115.

Analysis of 60 studies of operational and experimental human confinement with minimal associated elements of isolation and perceptual deprivation. In the operational situations so far encountered, negligible undesirable psychological effects have been observed, when highly trained and well-motivated subjects undergo realistic space-mission simulation. The requirements for free internal volume of space vehicles for long duration (400-day) missions, although not yet definitely established, are about 200 to 250 ft^3/man (minimum) in a multiman crew, the acceptable volume is about 350 to 400 ft^3/man, while the optimal volume lies in the range from 600 to 700 ft^3/man. R. M.

A68-41794 *
BACK CONTAMINATION.
J. E. Pickering (NASA, Washington, D.C.) and G. Briggs Phillips (Becton and Dickinson Co., Albuquerque, N. Mex.).
Contamination Control, vol. 7, Sept. 1968, p. 19-23.

Discussion of policy and technical recommendations, fomulated for inclusion into the Apollo lunar program, for preventing the transferral of contaminants from the moon to the earth by the astronauts or their equipment. An astronaut quarantine scheme for manned lunar missions, and a quarantine scheme for returned lunar samples are discussed. At nominal splashdown, egress of the astronauts and samples will be from the Command Module through a plastic tunnel into a mobile isolation van for subsequent transport by ship and aircraft to the isolation containment facilities of the Lunar Receiving Laboratory (LRL). The LRL, as a double biological barrier, satisfies both the concern of isolating any microbial life forms existent on the moon which could be dangerous to life forms on earth, and for preserving the integrity of the lunar material in a pristine or near pristine state free from earth contaminants.
M.G.

A68-41939
THE LAW OF RECIPROCITY OF IRRADIATION INTENSITY AND IRRADIATION TIME IN BIOLOGICAL RADIATION REACTIONS [ZUR REZIPROZITÄTSREGEL VON BESTRAHLUNGSSTÄRKE UND BESTRAHLUNGSZEIT BEI DER BIOLOGISCHEN STRAHLENWIRKUNG].
Horst Bücker.
Strahlentherapie, vol. 135, no. 1, 1968, p. 83-89. 5 refs. In German.

Analysis of deviations of the law of reciprocity of irradiation intensity and irradiation time occurring during biological radiation reactions. A mathematical analysis shows that such deviations can lead to a tolerance irradiation intensity and/or tolerance irradiation time. These considerations are applied to measurements of the pigment effect of ultraviolet radiation. Different models are discussed for direct pigmentation with time factors greater than and less than unity.
R.M.

A68-41944
CHEMICAL EVOLUTION AND THE ORIGINS OF PREBIOLOGICAL SYSTEMS [CHEMISCHE EVOLUTION UND DIE URSPRÜNGE PRÄBIOLOGISCHER SYSTEME].
Klaus Dose (Frankfurt, Universität, Max-Planck-Institut für Biophysik, Frankfurt am Main, West Germany).
Umschau in Wissenschaft und Technik, no. 21, 1967, p. 683-688. 18 refs. In German.

Study of the present state of research regarding the chemical and molecular aspects of biological evolution. The conditions on the earth before life evolved - especially the absence of atmospheric oxygen - are investigated, and the connection between chemical and biological evolution is shown. The energy sources for both types of evolution are evaluated. Experiments are described where - under conditions simulating a primitive planet without life - biologically important components are synthesized from very simple molecules. The experimental features involve exposure of the basic material to irradiation, studies of the effect of temperature, the trigger function of electric discharges, and polymerization processes that lead to the formation of prebiological systems such as microspheres and coacervate systems.
R.M.

A68-41945 *
ADAPTIVE CYCLES - THEIR SIGNIFICANCE FOR DEFINING ENVIRONMENTAL HAZARDS.
J. Aschoff (Max-Planck-Institut für Verhaltensphysiologie, Erling-Andechs, West Germany).
International Journal of Biometeorology, vol. 11, no. 3, 1967, p. 255-278. 66 refs.
Grants No. NsG-259-62; No. AF EOAR 66-15.

Discussion of the range and properties of biological rhythms, particularly circadian rhythms. Among the great variety of biological rhythms with frequencies ranging from less than 1 per millisecond to 1 per several years, there are four rhythms which represent adaptations to time structures of the environment. These are the tidal, diurnal, lunar, and seasonal rhythms. Using the diurnal or circadian rhythm as the most extensively studied sample, the following aspects are described: (1) the properties of biological, self-sustained oscillators under constant conditions, as well as under the influence of a synchronizing environmental rhythm; (2) the multiplicity of rhythmic functions in an organism, especially those of sensitivity to external stimuli; and (3) case of internal desynchronization in man. Rhythms with lower frequencies are briefly mentioned, and the problem of defining environmental hazards with regard to temporal organization in the environment, as well as in the organism, is discussed.
M.M.

A68-41946 *
THIRST AND ARTIFICIAL HEAT ACCLIMATIZATION IN MAN.
J. E. Greenleaf (NASA, Ames Research Center, Moffett Field; San Jose State College, San Jose, Calif.), L. G. Douglas, J. S. Bosco, M. Matter, Jr., and J. R. Blackaby.
(Swedish Nutrition Foundation, Symposium on Nutrition and Physical Activity, Tylösand, Sweden, Aug. 15-17, 1966.)
International Journal of Biometeorology, vol. 11, no. 3, 1967, p. 311-322. 26 refs.

Investigation of the relationship between serum osmotic changes, water intake, and water balance in four, fit young men during and after exercise in a hot environment, before and after artificial heat acclimatization. During exercise, before steady-state conditions were reached, voluntary water intakes generally paralleled, but were not proportional to the serum osmotic pressure. Under steady-state conditions, drinking was approximately proportional to the effective osmotic pressure of the serum. During the postexercise recovery period, when serum osmolarity returned to normal levels, water intake also subsided even though there was a total body water deficit of about 3%. Body weight did not return to control levels until 62 to 86 hr following exercise. This slow recovery could not be accounted for by a loss of water associated with glycogen use during excercise or by sweat electrolyte depletion. In general, the results supported Dill's hypothesis, but plasma volume changes, in addition to osmotic factors, are very likely operative in the initiation and satiation of drinking under these conditions. It is noted that perhaps slower acting volume-control mechanisms mediate the slow recovery of total body water.
M.M.

A68-42041
PROGRAM CLOCKS IN SMALL MAMMALS.
J. Lee Kavanau and Carl E. Rischer (California, University, Dept. of Zoology, Los Angeles, Calif.).
Science, vol. 161, Sept. 20, 1968, p. 1256-1259. 16 refs.
NSF Grant No. GB-3959.

Complex patterns of time, direction, and speed of running by small nocturnal mammals in activity wheels sometimes are duplicated almost exactly from night to night. These activity pattern repetitions disclose: (1) previously unknown capabilities of biological clocks to act as sequence programers for behavior; (2) that animals can retain a record of the sequence and timing of their activities covering an entire night; and (3) that the activities of one night can bias an animal toward similar behavior on subsequent nights.
(Author)

A68-42061 #
WHY DO ACCIDENTS REALLY HAPPEN?
C. Craig Wright (United States Steel Corp., Monroeville, Pa.).
IN: FLIGHT SAFETY FOUNDATION, ANNUAL BUSINESS AIRCRAFT SAFETY SEMINAR, 13TH, CHICAGO, ILL., MAY 13-16, 1968, PROCEEDINGS. [A68-42057 22-02]
Arlington, Va., Flight Safety Foundation, Inc., 1968, p. 33-38.

Discussion of the functioning of the human mind to explain how emotional stresses can and do produce accidents. Two fundamental hypotheses are postulated: (1) in the mind nothing happens by chance, and (2) unconscious mental processes are the most important in normal as well as in abnormal mental activity. It is considered that life is a compromise or accommodation between the drives originating in the id and the moral or ethical codes of the superego, with the ego acting as the mediator between them. The person who has a history of numerous accidents throughout his life is much more likely to have additional accidents than the individual who has been able to solve problems without resorting to unconsciously motivated mishaps.
F.R.L.

A68-42173
DESIGNING SPACECRAFT SYSTEM STERILITY.
A. M. Nowitzky.
IN: SPACECRAFT SYSTEMS; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 1. [A68-42132 22-31]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 421-429. 8 refs.

Description of an approach for designing the sterility of unmanned space vehicles. The approach involves design integration based on elementary thermodynamic principles, whereby a significant portion, if not the entire vehicle, may be internally sterilized during manufacture. In order to accomplish the necessary integration, a set of design guidelines has been derived. Having isolated heat-sensitive parts, the remainder of the vehicle is divided into a heat-resistant structure and an assemblage of materials and components which have been manufactured sterile. For acceptable biological reliability, the design concept must incorporate minimum assembly steps and permit terminal sterilization with an established sterilant gas. The guideline of internal sterility by manufacture is particularly interesting, especially with respect to electronic components. M. M.

A68-42174 *
DECONTAMINATION TECHNIQUES FOR LUNAR ORBITING SPACECRAFT.
F. N. LeDoux (NASA, Goddard Space Flight Center, Greenbelt, Md.).
IN: SPACECRAFT SYSTEMS; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 1. [A68-42132 22-31]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 431-436.

Brief description of decontamination techniques which were developed for the Anchored Interplanetary Monitoring Platform (AIMP) spacecraft, whose mission is scientific investigation in the vicinity of the moon. The decontamination techniques developed, the decontamination solutions applied, the methods employed for recovering viable organisms, the spacecraft assembly environment, and the overall results of the decontamination effort are briefly described. Figures depict the areas decontaminated with a particular solution, the manner of decontamination and/or sterilization, and the method of recovering viable microorganisms. M. M.

A68-42196
STIMULATION OF GROWTH OF THE ONION ALLIUM CERA AFTER SPACE FLIGHT OF THE BULBS ON SATELLITE-SHIP "KOSMOS-110."
N. L. Delone, E. M. Morozova, V. V. Antipov, G. P. Parfenov, and A. S. Trusova.
(Kosmicheskie Issledovaniia, vol. 5, Nov.-Dec. 1967, p. 939-943.)
Cosmic Research, vol. 5, Nov.-Dec. 1967, p. 794-797. 11 refs.
Translation.
[For abstract see issue 05, page 766, Accession no. A68-16835]

A68-42203 *
A LIVING ORGANISM MORPHOLOGICALLY COMPARABLE TO THE PRECAMBRIAN GENUS KAKABEKIA.
S. M. Siegel and B. Z. Siegel (Hawaii, University, Dept. of Botany and Dept. of Microbiology, Honolulu, Hawaii).
American Journal of Botany, vol. 55, July 1968, p. 684-687.
Contract No. NASw-767; Grant No. NGR-12-001-042.

A living species of the fossil genus Kakabekia, isolated from a soil sample secured at Harlech Castle, Wales, is described. It resembles the type species K. umbellata Barghoorn in all major respects - tripartite structure consisting of mantle, stiple, and basal enlargement and size range of 5 to 15 μ. Variations in the cultured form include mantle margin (entire to scalloped), mantle radial structure (6- to 8-parted, but sometimes 5- to 9-parted), and concentric rings. The name K. barghoorniana is proposed in recognition of the discoverer and author of the fossil genus. (Author)

A68-42206 *
OPERANT REINFORCEMENT OF A SKELETALLY MEDIATED AUTONOMIC RESPONSE - UNCOUPLING OF THE TWO RESPONSES.
Rochelle J. Gavalas (California, University, Brain Research Institute, Los Angeles, Calif.).
Psychonomic Science, vol. 11, no. 6, 1968, p. 195, 196. 13 refs.
Contracts No. AF 49(638)-1387; No. Nonr-233(91); Grants No. NsG-237-62; No. NsG-05-007-003.

Experimental investigation of the mediation hypothesis as an explanation of the effects of operant reinforcement on autonomic responses. The mediation explanation of the effect of operant reinforcement on autonomic responses assumes that skeletally mediated autonomic responses can be easily and fortuitously conditioned. The experimental results showed that GSR (galvanic skin response) deflections which were known to be skeletally mediated were operantly reinforced. The two responses became uncoupled: the skeletal (deep respiration) response showed a classic instrumental learning curve; the autonomic response showed great variability and only marginal gains during extinction. It is possible that these marginal gains were artifactual, since the percent of deep respirations eliciting GSRs showed a marked habituation to increasing repetitions of the respiration response. M. M.

A68-42399 *
CONDITIONED SUPPRESSION OF HYPOTHALAMIC SELF-STIMULATION BASED ON LOW OXYGEN LEVELS.
Zoltan Annau and Stephen A. Weinstein (Johns Hopkins University, School of Hygiene and Public Health, Dept. of Environmental Medicine and Dept. of Psychiatry, Laboratory of Behavioral Physiology, Baltimore, Md.).
Communications in Behavioral Biology, vol. 2, July 1968, p. 1-6. 10 refs.
PHS Grants No. HE-01929; No. TG-HTS 5453; No. HE-06945; Grant No. NGR-21-001-035; Contract No. DA-49-193-MD-2726.

Hypoxia has been shown to produce a decrease in hypothalamic self-stimulation (Annau and Weinstein, 1967). In the present experiments, eight male rats were trained to lever press on a 17-sec variable interval schedule. The reward was stimulation of the medial forebrain bundle. Utilizing the conditioned suppression paradigm of Estes and Skinner (1941), the suppression of self-stimulation produced by 6% oxygen was conditioned. On "test" trials, the conditioned stimulus presented alone suppressed behavior as markedly as 6% oxygen. This conditioning effect extinguished after seven days due to the animals' ability to distinguish between the physiological concomitants of hypoxia and the state induced by the conditioned signal. (Author)

A68-42400 *
HYPOTHALAMIC SELF-STIMULATION - INTERACTION OF HYPOXIA AND STIMULUS INTENSITY.
Zoltan Annau and Stephen A. Weinstein (Johns Hopkins University, Dept. of Environmental Medicine and Dept. of Psychiatry and Laboratory of Behavioral Physiology, Baltimore, Md.).
Life Sciences, vol. 6, no. 13, 1967, p. 1355-1360. 16 refs.
Army-supported research; Contract No. DA-49-193-MD-2726; PHS Grants No. HE-01929; No. TG-HTS-5453; No. HE-06945; Contract No. NR-102-101; Grant No. NGR-21-001-035.

Description and results of an experiment to investigate systematically the effects of hypoxia on a skilled motor task (lever pressing for brain stimulation) performed by albino rats, and, further to determine the interaction between hypoxia and changes in CNS activity due to changes in the intensity of a brain stimulating current. Four such rats were placed in a chamber provided with a switch, which when activated by the rats produced brain stimulation through electrodes implanted in the medial forebrain bundle. The oxygen level of the chamber was made to correspond to four levels of hypoxia (14% O_2, 12% O_2, 10% O_2, and 8% O_2) presented in random order. In the first part of the experiment, the current was adjusted to produce 100 responses/min (high motivation) and in the second part, to produce 50 responses/min (low motivation). It is shown that

motivation is of major importance in the determination of the effects of hypoxia on performance. P. G. M.

A68-42596 #
VENTILATION AND PULMONARY GAS EXCHANGE DURING HEADWARD (+GZ) GRADIENT ACCELERATION.
Anthony R. Dowell, Spencer Shropshire, Jr., and Michael McCally (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 39, Sept. 1968, p. 926-934. 48 refs.
USAF-sponsored research.

Measurements of ventilation and pulmonary gas exchange, made in ten subjects exposed to $+3\text{-}G_z$ gradient acceleration at the feet for one hour. A steady state of pulmonary gas exchange was achieved during acceleration, in that minute ventilation, 0_2 consumption, CO_2 production, and gas exchange R were not significantly changed from control values. A decrease in end-tidal CO_2 tension accompanied an increase in the a-A CO_2 difference from 0.4 to 5.0 mm Hg. Alveolar dead-space ventilation increased, and the fraction of alveoli which were unperfused but ventilated rose from 2.7 to 18.1%. The rise in the fraction of alveoli which were unperfused but ventilated occurred at the expense of the fraction of alveoli which were evenly perfused and ventilated. Arterial hypoxemia and an increase in A-a O_2 difference were found during acceleration and were related to an increase in venous admixture into the arterial system. The alveolar blood shunt fraction rose from 4.4 to 7.3% during $+G_z$ spin, while the fraction of alveoli which were perfused but unventilated rose from 4.2 to 6.2%. The rise in the A-a O_2 difference during $+G_z$ gradient spin was due to a marked decrease in the number of perfused alveoli plus a slight increase in the number of perfused but unventilated alveoli.
M. M.

A68-42597 *
CARBON DIOXIDE CONTROL FOR MANNED SPACECRAFT.
R. B. Martin (NASA, Langley Research Center, Hampton, Va.).
Aerospace Medicine, vol. 39, Sept. 1968, p. 937-941. 9 refs.

Several methods are examined for removing carbon dioxide and maintaining a habitable atmosphere for manned spacecraft. Three systems utilizing the Molecular Sieve regenerative sorber are compared as replacement for the current LiOH nonregenerative system. The characteristics of each method are discussed and compared with respect to fixed system weight, power penalty, and the material losses incurred. A nonregenerative sorber, the consumable loss portion of a fuel cell power penalty, ullage and heat losses are shown as time dependent expendables that must be reduced in order to be able to attain efficient operation for longer missions. The means of collecting carbon dioxide to allow the recovery of oxygen is discussed with respect to the influence exerted on the design of the carbon dioxide system. Tradeoffs of these systems are shown for mission durations of up to 150 days. (Author)

A68-42598
PERFORMANCE DECREMENT IN A FLIGHT SIMULATOR DUE TO GALVANIC STIMULATION OF THE VESTIBULAR ORGAN AND ITS VALIDITY FOR SUCCESS IN FLIGHT TRAINING.
Vladimir Malcik (Institute of Aviation Medicine, Prague, Czechoslovakia).
Aerospace Medicine, vol. 39, Sept. 1968, p. 941-943. 7 refs.

The vestibular organs of pilot subjects were stimulated by galvanic current which evoked illusions of flight during task performances inside a flight simulator (FS). Pilots with different amounts of instrument flying and varying extents of time since the last instrument flight were examined by the illusion technique and a significant difference was discovered in their performance decrements. Pilots who had greater amounts and most recent use of flight instruments gave better performances. It is suggested that this method be used to acquaint FS trainees with illusions and to allow them opportunity to judge the compensation required to prevent interference during their simulated flights. (Author)

A68-42599
EFFECT OF PARTIAL BODY COOLING ON MAN EXERCISING IN A HOT, DRY ENVIRONMENT.
Armand J. Gold and Abraham Zornitzer (Negev Institute for Arid Zone Research, Dept. of Environmental Physiology, Beersheva, Israel).
Aerospace Medicine, vol. 39, Sept. 1968, p. 944-946.
Research supported by the Israel National Council for Research and Development.

The modified Craig index of physiological strain, I_s, was determined in six young men subjected to combined heat (40 and 50°C) and exercise stress. Exercise consisted of successive one-half hour periods of walking on a treadmill at 3 and 5 km/hr, either at zero or 5° inclination. These experiments were repeated using the partial body cooling suit, which consisted of long underwear lined with plastic tubes through which water at 20 to 21°C was circulated. The tube distribution pattern (total length, 40 m) covered the chest, back, upper arms, and thighs. In the absence of cooling, I_s increased from 1.7 after one hour of walking at 25°C to 2.4 (40°C), 3.3 (50°C, zero inclination), and 4.5 (50°C, 5° inclination). With cooling, the I_s increase was reduced to 2.0, 2.5, and 3.4, respectively. Cooling had no perceptible effect on the metabolic rate.
(Author)

A68-42600
EFFECTS OF SLEEP DEPRIVATION ON THE VESTIBULO-OCULAR REFLEX.
James W. Wolfe and James H. Brown (U.S. Army, Medical Research Laboratory, Fort Knox, Ky.).
Aerospace Medicine, vol. 39, Sept. 1968, p. 947-949. 18 refs.

Sixteen young adult men were deprived of sleep for a period of 24 hr in order to assess possible interactions between sleep mechanisms and the vestibular system. The subjects were given pre- and post-tests consisting of angular accelerations of $8°/sec^2$ and $24°/sec^2$. Following sleep deprivation, the subjects showed a significant increase in fast-phase frequency at $24°/sec^2$, and a nonsignificant increment at $8°/sec^2$. Slow-phase output showed no significant change at either $8°/sec^2$ or $24°/sec^2$. Neither thresholds for stimulus onset nor durations of primary nystagmus showed significant changes for either intensity. Discussion centers around possible physiological mechanisms related to the interaction of sleep and vestibular responses. (Author)

A68-42601 *
TRANSFER OF HABITUATION OF MOTION SICKNESS ON CHANGE IN BODY POSITION BETWEEN VERTICAL AND HORIZONTAL IN A ROTATING ENVIRONMENT.
Ashton Graybiel, Alfred R. Fregly, James K. Colehour, Edward L. Ricks, Jr. (U.S. Naval Aerospace Medical Center, Aerospace Medical Institute, Pensacola, Fla.), Allen B. Thompson (General Electric Co., Houston, Tex.), and F. Robert Deane (U.S. Navy, Naval Air Station, Miramar, Calif.).
Aerospace Medicine, vol. 39, Sept. 1968, p. 950-962. 26 refs.
NASA-sponsored research.

Description of an experimental investigation, with respect to motion sickness, that was conducted in a circular rotating room 20 ft in diameter. A unique feature was the provision for subjects to walk and carry out their tasks while horizontal to gravity and at right angles to the axis of rotation. This ability to walk along the wall was made possible by the use of air-bearing supports and custom-fitted articulated fiberglass molds. Efforts were made to ensure a degree of comfort and level of activity in the horizontal mode fairly comparable to that in the vertical mode. Four subjects participated in two experimental trials involving habituation to the artificial force environment with the room rotating at 4 rpm. The changing symptomatology with regard to motion sickness and postural equilibrium yielded information supporting the following statements. Susceptibility to motion sickness was similar in the two orientational modes. Adaptation and habituation with respect to motion sickness in one orientation mode transferred to the other mode. Vestibular habituation in the horizontal mode ensuring freedom from symptoms of motion sickness did not prevent ataxia on change to the vertical mode. In the start-vertical mode, habituation of motion sickness and postural disequilibrium was concurrent. The postrotatory perseveration of postural habituation to the rotating environment for as long as 36 hr after the cessation of rotation, by restricting the subjects' activity, shed some light on the underlying homeostatic mechanism and indicated the experimenter's control over the dynamics of this process. Within the limitations of this experiment, the

findings indicate that habituation of motion sickness acquired in the slow-rotation room with a subject parallel to the axis of rotation transfers to the orientation with subject at right angles to the axis of rotation, the situation in a rotating spacecraft. M. M.

A68-42602
EFFECTS OF REDUCED GRAVITY ENVIRONMENTS ON HUMAN PERFORMANCE.
E. C. Wortz (Garrett Corp., Los Angeles, Calif.).
Aerospace Medicine, vol. 39, Sept. 1968, p. 963-965. 20 refs.

Current data for energy expenditures for work during weightlessness and simulated lunar gravity appear contradictory. The position presented herein considers weightless and lunar gravity performance on a single continuum of reduced traction. It is concluded that reduction in traction systematically reduces the efficiency of work for all reduced gravity conditions. (Author)

A68-42603 *
ATRAUMATIC MEASUREMENT OF THE ISOMETRIC RELAXATION PERIOD OF THE LEFT VENTRICLE.
David H. Spodick (Lemuel Shattuck Hospital, Cardiology Div.; Tufts University, School of Medicine; Boston, University, School of Medicine, Boston, Mass.) and Sudarshan Kumar (Tufts University, School of Medicine; Lemuel Shattuck Hospital, Boston, Mass.).
Aerospace Medicine, vol. 39, Sept. 1968, p. 968, 969. 14 refs.
Grant No. NGR-22-012-006.

The time from the aortic valve sound to the zero point of the apexcardiogram (II_A-0 interval) was measured in 50 healthy young men, yielding a range of 40 to 100 msec (mean 67 ± 14 msec). These results were compared with those reported by other investigators for the isometric relaxation period by the II_A-0 interval and other techniques. (Author)

A68-42604
RETENTION OF INHALED AIR IONS BY HUMANS.
Merrell E. Crandell and Charles H. Bachman (Syracuse University, Physics Dept., Syracuse, N. Y.).
Aerospace Medicine, vol. 39, Sept. 1968, p. 972-974. 9 refs.

A model has been derived relating the retention of inhaled air ions to the volumes and times involved in respiration and the mobility of the ions. This model has been experimentally tested by measuring the number of ions inhaled by eight male subjects. From the results of this investigation, it appears that the model is a valid approximation of the process of ion retention. (Author)

A68-42605 #
INSENSIBLE WEIGHT AND WATER LOSS DURING SIMULATED SPACE FLIGHT.
George F. Gee, Richard S. Kronenberg, and Roy E. Chapin (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).
Aerospace Medicine, vol. 39, Sept. 1968, p. 984-988. 10 refs.

Three balance studies, concerned primarily with water balance, have been completed with 12 military men who consumed diets of dehydrated bite-size and powdered formula foods. The affects of confinement, gas composition, and a hypobaric environment on body weight, water and food consumption, urine and fecal excretion, body volume, and total body water were studied. Insensible weight loss was computed from weights of the body, of food and water intake, and of urine and fecal excretion. Insensible weight loss was unaffected by the hypobaric environment and averaged 1.4 kg per man per day with an extreme individual range from 0.9 to 2.9 kg per day. The total body water for four men decreased from an average of 44.4 to 41.6 kg during the 16-day period in the hypobaric environment. Insensible water loss was computed from the weights of body water, water intake, oxidative water, and of urine and fecal water excretion. Insensible water loss was greater in the hypobaric environment. No detrimental effects of the hypobaric environment were observed during the exposure. (Author)

A68-42606
MICROBIOLOGICAL EVALUATION OF A TYPICAL SUIT LOOP HEAT EXCHANGER DURING MANNED TESTING.
Ronald Nachum and Max D. Lechtman (Garrett Corp., AiResearch Manufacturing Co., Dept. of Life Sciences, Los Angeles, Calif.).
Aerospace Medicine, vol. 39, Sept. 1968, p. 988-993. 9 refs.

Investigation of the accumulation and growth of microorganisms in a water separator of the wick type used in a typical spacecraft suit loop during 114 hr of manned pressure-suit testing. The microbiological tests were performed over a 2-1/2-month period in conjunction with sea-level tests of the suit at controlled levels of partial pressures of carbon dioxide and at controlled work rates. Suit effluent air was passed through the wick separator that conditioned the air at a 50°F dew-point temperature and captured excess wastes. Inlet and outlet gases flowing through the wick separator were sampled periodically with glass capillary impingers. Impinger fluids and water condensates collected from a cyclic accumulator were analyzed for the presence of viable microorganisms. The analysis indicated low bacterial counts in the suit effluent gases entering the wick separator and on the separator condensing plates themselves. On the other hand, bacteria were consistently found in the condensate effluent from the cyclic accumulator pumps. The suit effluent air contained only low numbers of microorganisms. Microbial evaluation of the inner linings of the suit showed these to be heavily contaminated. M. M.

A68-42607
PILOT PERFORMANCE DURING PERIODS OF ANTICIPATORY PHYSICAL THREAT STRESS.
Barbara L. Drinkwater, Troy Cleland, and M. Marilyn Flint.
Aerospace Medicine, vol. 39, Sept. 1968, p. 994-999. 6 refs.
Research supported by the University of California.

The effect of anticipatory stress on the performance of general aviation pilots flying a simulated instrument flight under the threat of electric shock was investigated. No differences were found in the performance of the group which received a shock for each control error, and the group which could avoid the shock by correcting an error within 5 sec. However, both groups improved their altitude-airspeed control significantly during the stress flights while tracking accuracy deteriorated. The results support "perceived relevance of own performance to event occurrence" as a secondary determiner in the theoretical model of anticipatory physical threat stress. Subjects with lower initial skill tended to perceive the shock as more threatening than did the better skilled pilots. No definite trend in the effect on performance of flight experience or of perceived probability of receiving a shock was established. (Author)

A68-42608
SIDE-EFFECTS OF l-HYOSCINE AND CYCLIZINE STUDIED BY OBJECTIVE TESTS.
J. J. Brand (Royal Naval Medical School, Alverstoke, Hants., England), W. P. Colquhoun (Medical Research Council, Applied Psychology Research Unit, Cambridge, England), and W. L. M. Perry (Edinburgh, University, Medical School, Dept. of Pharmacology, Edinburgh, Scotland).
Aerospace Medicine, vol. 39, Sept. 1968, p. 999-1002. 10 refs.

Doses of l-hyoscine base of 0.1, 0.42, and 0.7 mg, and of Cyclizine hydrochloride of 15 and 100 mg, were given by mouth to groups of volunteer subjects. Measurements of saliva flow, resting pulse rate, accommodative power, and mental performance were then carried out at various time intervals after dose. The l-hyoscine at doses of 0.42 and 0.7 mg gave rise to depression of saliva flow and a fall in pulse rate, but had no measurable effect on power of accommodation. These effects were well established at 2 to 3 hr after dose and appeared to have worn off after 6 hr. The Cyclizine hydrochloride at doses of 15 and 100 mg produced no effects of this nature, and therefore no accurate response time data could be obtained using these parameters. Neither of the two drugs produced any significant effect on tests of vigilance or speed of arithmetical computation. (Author)

A68-42746
RECORDING OF PHYSIOLOGICAL DATA IN SPACE.
George A. Lamb (Garrett Corp., AiResearch Manufacturing Co., Los Angeles, Calif.).

IN: INSTRUMENT SOCIETY OF AMERICA, NATIONAL AEROSPACE INSTRUMENTATION SYMPOSIUM, 13TH, SAN DIEGO, CALIF., JUNE 13-16, 1967, PROCEEDINGS. [A68-42727 22-14] Pittsburgh, Pa., Instrument Society of America, 1967, p. 227-244. 9 refs.

Discussion of the history of physiological data measurements and the problems which make the medical-to-instrumentation translation difficult. The Biomedical Magnetic Tape System used by NASA Flight Research Center, Edwards, Calif., is discussed in detail. Physiological performance charts, including diagrams of temperature-humidity effects, the ASHRAE comfort chart, thermal requirements for tolerance and comfort in aircrafts, walking under subgravity conditions, etc., are presented. R.M.

A68-42747
APPLICATIONS OF MINIATURE BIOTELEMETRY SYSTEMS TO SPACE MEDICINE.
John P. Meehan and Roland D. Rader (Southern California, University, School of Medicine, Dept. of Physiology, Los Angeles, Calif.).
IN: INSTRUMENT SOCIETY OF AMERICA, NATIONAL AEROSPACE INSTRUMENTATION SYMPOSIUM, 13TH, SAN DIEGO, CALIF., JUNE 13-16, 1967, PROCEEDINGS. [A68-42727 22-14] Pittsburgh, Pa., Instrument Society of America, 1967, p. 245-250.

Description of a telemetry system for recording physiological parameters from unrestrained experimental subjects. A specialized low-power, stable, miniaturized telemetry system for biological experiments on human and animal subjects is described. The design of such sensing and data-transmission systems and components is outlined, with emphasis on astrobiomedical applications. Z.W.

A68-42748 *
ERGOMETER FOR APOLLO.
Jean Bordeaux (Beckman Instruments, Inc., Fullerton, Calif.).
IN: INSTRUMENT SOCIETY OF AMERICA, NATIONAL AEROSPACE INSTRUMENTATION SYMPOSIUM, 13TH, SAN DIEGO, CALIF., JUNE 13-16, 1967, PROCEEDINGS. [A68-42727 22-14] Pittsburgh, Pa., Instrument Society of America, 1967, p. 251-258. Contract No. NAS 9-5142.

Description of a reciprocating motion "ergometer" for use in measuring the workload of astronauts in a spacecraft. Workload is read out with analog output and is adjustable for the range from 0 to 70 W. The ergometer provides a capability which is new: application of a repeatable workload which permits more critical monitoring of physiological status during space missions. Data from the Apollo Ergometer will undoubtedly provide the answers to many questions concerning man's ability to survive the environment of space. (Author)

A68-42749
SYSTEM CONSIDERATIONS FOR BIOTELEMETRY FROM HOSTILE ENVIRONMENTS.
Harve M. Hanish (Biocom, Inc., Culver City, Calif.).
IN: INSTRUMENT SOCIETY OF AMERICA, NATIONAL AEROSPACE INSTRUMENTATION SYMPOSIUM, 13TH, SAN DIEGO, CALIF., JUNE 13-16, 1967, PROCEEDINGS. [A68-42727 22-14] Pittsburgh, Pa., Instrument Society of America, 1967, p. 259-261.

Some logical sequential considerations are outlined for the design of a flexible, modular, miniaturized biotelemetry system. While using discrete components, this design lends itself to future miniaturization utilizing existing integrated circuits. Direct digital conversion of PWM data may be easily accomplished using this approach. (Author)

A68-42750
RATER AND LOGIT - A NEW APPROACH TO CREW PERFORMANCE ASSESSMENT.
R. S. French (General Dynamics Corp., Convair Div., San Diego, Calif.).
IN: INSTRUMENT SOCIETY OF AMERICA, NATIONAL AEROSPACE INSTRUMENTATION SYMPOSIUM, 13TH, SAN DIEGO, CALIF., JUNE 13-16, 1967, PROCEEDINGS. [A68-42727 22-14] Pittsburgh, Pa., Instrument Society of America, 1967, p. 263-278. 14 refs.

Description of the Response Analysis Tester (RATER) and the Logical Interference Tester (LOGIT) for crew performance assessment. The relative psychomotor efficiency within the individual is measured, relating his performance to a previously established baseline. RATER measures a relatively simple sensory-motor skill, LOGIT measures higher mental processes, including reasoning, memory, and decision skills. R.M.

A68-42753 *
MARS BIOLOGICAL LABORATORY.
Daniel N. Tompkins (Philco-Ford Corp., Space and Re-Entry Systems Div., Newport Beach, Calif.).
IN: INSTRUMENT SOCIETY OF AMERICA, NATIONAL AEROSPACE INSTRUMENTATION SYMPOSIUM, 13TH, SAN DIEGO, CALIF., JUNE 13-16, 1967, PROCEEDINGS. [A68-42727 22-14] Pittsburgh, Pa., Instrument Society of America, 1967, p. 297-308. Contract No. NASw-1065.

Unmanned exploration of Mars will occur in the 1970s. A prime objective is to sense the ecology and determine if life ever has been or is now being supported on that planet. Because of the complex detection process, many instruments are required to perform the necessary experiments. There will be orderly growth in a biological laboratory for launch opportunities from 1973 to 1979. The model discussed here is a hypothetical design, intended to encompass major technological uncertainties. Its evolution has uncovered unusual and challenging projects for further investigation. (Author)

A68-42771
NEW HORIZONS IN BIOMEDICAL INSTRUMENTATION.
Bernd Ross (Bell and Howell Co., Research Laboratories, Pasadena, Calif.).
IN: INSTRUMENT SOCIETY OF AMERICA, NATIONAL AEROSPACE INSTRUMENTATION SYMPOSIUM, 13TH, SAN DIEGO, CALIF., JUNE 13-16, 1967, PROCEEDINGS. [A68-42727 22-14] Pittsburgh, Pa., Instrument Society of America, 1967, p. 489-502. 5 refs.

Predictions about future trends in medical instrumentation are made based upon the present status of electronic devices and sensors. Past trends are analyzed in order to allow extrapolation of reliability, cost, and weight of devices. Emphasis is given to the use of optoelectronic techniuqes as a new aid in diagnostics. A design example is given of an instrument using these techniques. Possibilities of inscribing highly portable memories with data generated by implanted sensors are explored. (Author)

A68-42774
LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5.
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967. 322 p. In English, Russian, Spanish, and French. $20.

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DETERMINING THE EFFECTIVENESS OF FRACTIONAL G LEVELS IN REDUCING CIRCULATORY DECONDITIONING OF SPACEFLIGHT CREWS - A NEW TECHNIQUE AND PRELIMINARY RESULTS. A. B. Thompson (General Electric Co., Houston, Tex.), A. Graybiel, and D. B. Cramer (U.S. Naval Aviation Medical Center, Pensacola, Fla.), p. 57-64. 11 refs. [See A68-42780 22-05]

LOWER BODY NEGATIVE PRESSURE AND CARDIOVASCULAR DECONDITIONING DURING SIMULATED WEIGHTLESSNESS. P. M. Stevens (Kentucky, University, Lexington, Ky.), p. 65-74. [See A68-42781 22-04]

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EYE SENSITIVITY UNDER HYPOXIA [LA SENSIBILITE OCULAIRE EN HYPOXIE]. M. P. Popescu, M. Stefan, D. Pavel, and N. Cincă (Centre Médical de l'Aviation, Bucharest, Rumania), p. 99-106. 19 refs. [See A68-42785 22-04]

EFFECTS OF COMBINED LINEAR AND VIBRATORY ACCELERATIONS ON HUMAN BODY DYNAMICS AND PILOT PERFORMANCE CAPABILITIES. H. C. Vykukal and C. B. Dolkas (NASA, Ames Research Center, Moffett Field, Calif.), p. 107-116. 7 refs. [See A68-42786 22-05]

EXTRAVEHICULAR ACTIVITIES AND LIFE SUPPORT.

SPACE EXTRAVEHICULAR OPERATIONS - A REVIEW OF THE REQUIREMENTS AND ALTERNATE SYSTEM APPROACHES. L. M. Seale (Bell Aerospace Corp., Buffalo, N.Y.) and P. N. van Schaik (USAF, Systems Command, Wright-Patterson AFB, Ohio), p. 119-137. 6 refs. [See A68-42787 22-05]

INFORMATIONAL MODEL OF THE DYNAMICS OF MOTION, AND THE SPATIAL ORIENTATION OF AN ASTRONAUT OUTSIDE HIS SPACECRAFT [INFORMATSIONNAIA MODEL' DINAMIKI DVIZHENIIA I PROSTRANSTVENNAIA ORIENTIROVKA KOSMONAVTA VNE KORABLIA]. A. A. Popov, Iu. A. Rozanov, and M. M. Sil'vestrov (Akademiia Nauk SSSR, Moscow, USSR), p. 139-145. [See A68-42788 22-05]

EXPANDABLE AND MODULAR STRUCTURES TECHNOLOGY FOR SUPPORT OF MANNED MISSIONS. F. W. Forbes (USAF, Systems Command, Wright-Patterson AFB, Ohio) and M. I. Yarymovych (NASA, Office of Manned Space Flight, Washington, D.C.), p. 147-158. [See A68-42789 22-31]

PROBLEMS OF THE PROLONGED AUTONOMOUS EXISTENCE OF HUMANS IN SPACESUITS [K PROBLEME DLITEL'NOGO AVTONOMNOGO SUSHCHESTVOVANIIA CHELOVEKA V KOSMICHESKOM SKAFANDRE]. A. M. Genin and L. G. Golovkin, p. 159-164. [See A68-42790 22-05]

DESCRIPTION OF THE ASTRONAUT MANEUVERING UNIT. G. M. Monroe and W. C. McMillin (LTV Aerospace Corp., Dallas, Tex.), p. 165-174. [See A68-42791 22-05]

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EFFECTS OF DEHYDRATED, LIQUID, AND COMPRESSED FOODS AND ENVIRONMENT ON HUMAN WASTE AND WATER CONSUMPTION IN DEVELOPING LIFE SUPPORT SYSTEMS REQUIREMENTS. A. R. Slonim (USAF, Systems Command, Wright-Patterson AFB, Ohio), p. 183-192. [See A68-42793 22-05]

AN EVALUATION OF MAN'S CAPABILITY TO PERFORM SUPPORT FUNCTIONS IN SPACE. C. B. May (USAF, Systems Command, Wright-Patterson AFB, Ohio) and A. E. Holmes (Martin Marietta Corp., Baltimore, Md.), p. 193-204. 13 refs. [See A68-42794 22-05]

HABITABILITY AND THE BIOTECHNOLOGICAL ASPECTS OF THE LIFE-SUPPORT SYSTEMS OF SPACECRAFT AND PLANETARY STATIONS [OBITAEMOST' I BIOLOGO-TEKHNICHESKIE ASPEKTY SISTEM ZHIZNEOBESPECHENIIA KOSMICHESKIKH KORABLEI I PLANETNYKH STANTSII]. B. A. Adamovich and Iu. G. Nefedov (Akademiia Nauk SSSR, Moscow, USSR), p. 205-212. [See A68-42795 22-05]

PRINCIPLES OF THE BIOMECHANICS OF HUMANS IN UNSUPPORTED POSITIONS [OSNOVY BIOMEKHANIKI CHELOVEKA V BEZOPORNOM POLOZHENII]. V. I. Stepantsov and A. V. Eremin (Akademiia Nauk SSSR, Moscow, USSR), p. 213-217. [See A68-42796 22-05]

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PROBLEMS OF BIOTELEMETRY IN LONG SPACE FLIGHTS [PROBLEMY BIOTELEMETRII V DLITEL'NYKH KOSMICHESKIKH POLETAKH]. I. T. Akulinichev, A. M. Zhdanov, and I. I. Popov, p. 237-244. [See A68-42798 22-05]

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COMPUTER ASSESSMENT OF THE ELECTROENCEPHALOGRAM AS A MEASURE OF FATIGUE IN MAN AND SUB-HUMAN PRIMATES UNDER PARTIALLY SIMULATED CONDITIONS OF SPACE TRAVEL (NOT WEIGHTLESSNESS). L. D. Proctor, W. R. McCrum, T. E. LeVere, and H. van den Ende (Henry Ford Hospital, Detroit, Mich.), p. 251-263. [See A68-42800 22-05]

OXYGEN BALANCE OF THE ORGANISM DURING THE PROLONGED ACCELERATIONS [KISLORODNYI BALANS ORGANIZMA PRI DLITEL'NYKH USKORENIIAKH]. A. S. Barer, G. A. Golov, V. B. Zubavin, E. I. Sorokina, and E. P. Tikhomirov (Akademiia Nauk SSSR, Moscow, USSR), p. 265-274. 8 refs. [See A68-42801 22-05]

CONTROL OF TRACE CONTAMINANTS FROM CANDIDATE MATERIALS IN SPACE CABIN ATMOSPHERES. P. P. Mader and E. S. Mills (McDonnell Douglas Corp., Santa Monica, Calif.), p. 275-282. [See A68-42802 22-05]

SIMULATION OF ENERGY-EXCHANGE PROCESSES IN ECOLOGICAL SYSTEMS [MODELIROVANIE PROTSESSOV ENERGOOBMENA V EKOLOGICHESKIKH SISTEMAKH]. A. B. Rubin (Akademiia Nauk SSSR, Moscow, USSR), p. 283-286. [See A68-42803 22-05]

CERTAIN PROBLEMS CONCERNING THE ACTION OF G-FORCES IN SPACE FLIGHT - CUMULATIVE AND ADAPTIVE EFFECTS [NEKOTORYE PROBLEMY DEISTVIIA PEREGRUZOK V KOSMICHESKOM POLETE - EFFEKTY KUMULIATSII I ADAPTATSII]. A. R. Kotovskaia (Akademiia Nauk SSSR, Moscow, USSR), p. 287-292. [See A68-42804 22-05]

THE APPLICATION OF AEROSPACE BIOINSTRUMENTATION TECHNOLOGY TO CLINICAL MEDICINE. J. A. Reeves (Spacelabs, Inc., Van Nuys, Calif.), p. 293-298.

A SPACE RADIATION MONITORING SYSTEM FOR SUPPORT OF MANNED SPACEFLIGHT. D. E. Ewing (USAF, Kirtland AFB, N. Mex.), p. 299-307. [See A68-42805 22-05]

TRANSFORMATION OF HUMAN WASTE PRODUCTS AND THE BIOCOMPLEX TO MAINTAIN A LIFE CYCLE IN SMALL CLOSED SPACES [O TRANSFORMATSII PRODUKTOV ZHIZNEDEIATEL'NOSTI CHELOVEKA I BIOKOMPLEKSA PRI OSUSHCHESTVLENII KRUGOVOROTA VESHCHESTV V MALYKH ZAMKNUTYKH PROSTRANSTVAKH]. V. I. Iazdovskii, A. L. Agre, B. G. Gusarov, Iu. E. Siniak, S. V. Chizhov, and S. I. Tsitovich (Akademiia Nauk SSSR, Moscow, USSR), p. 309-315. [See A68-42806 22-05]

A68-42775
PHYSIOPATHOLOGY OF THE WEIGHTLESS STATE [FISIOPATOLOGIA DEL ESTADO DE INGRAVIDEZ].
M. Nieto Boqué (Barcelona, Academia de Ciencias Médicas, Barcelona, Spain).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 3-7. In Spanish.

Study of the effects of the weightlessness experienced by the Soviet cosmonauts, based on the statistics published by the Academy of Medical Sciences of the USSR. Difficulties encountered in the weightless state involved the intake of food and drink and the elimination of waste products. The cosmonauts have been obliged to use orthopedic apparatus, in order to overcome these difficulties; they have also experienced dizziness, disorientation, and pulse acceleration. Comparative tables of the pulse accelerations are given to show the physiological reactions of the various cosmonauts to particular stresses. P.v.T.

A68-42776 *
MAN'S RESPONSE TO A NEW ENVIRONMENT INCLUDING WEIGHTLESSNESS - GEMINI BIOMEDICAL RESULTS.
Ch. A. Berry (NASA, Manned Spacecraft Center, Houston, Tex.).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 9-23.
[For abstract see issue 01, page 16, Accession no. A67-11394]

A68-42777
PHYSIOLOGICAL MEASUREMENTS IN SPACE - PRINCIPLES AND METHODS [FIZIOLOGICHESKIE IZMERENIIA V KOSMOSE - PRINTSIPY I METODY].
V. V. Parin, B. B. Egorov, and R. M. Baevskii (Akademiia Nauk SSSR, Moscow, USSR).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 25-37. 10 refs. In Russian.

Survey of the principles and techniques used in physiological measurements conducted in space and description of the most significant experiments achieved. The first seismocardiogram was obtained with a dog on board the Sputnik 3 satellite. Beginning with the flight of the cosmonauts Bykovskii and Tereshkova, seismocardiography was utilized in all flights. Examples are given of certain new methods for pulse analysis in space medicine. Studies of the coordination of motions under space-flight conditions are reviewed, along with observations of the cardiovascular system. Experiments conducted on the Cosmos 110 satellite are outlined, and certain significant results are discussed. Future developments are examined, and attention is given to the need for telemetry within the cabin to ensure unhampered motion and to improve data processing on board the spacecraft. T.M.

A68-42778 *
VISUAL PROBLEMS OF EXTENDED SPACEFLIGHT.
W. L. Jones (NASA, Office of Advanced Research and Technology, Biotechnology and Human Research Div., Washington, D.C.).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 39-48. 13 refs.
[For abstract see issue 02, page 189, Accession no. A67-12408]

A68-42779
THE PROBLEM OF PHARMACOLOGY IN SPACE MEDICINE [PROBLEMA FARMAKOLOGII V KOSMICHESKOI MEDITSINE].
V. E. Belai, P. V. Vasil'ev, and G. D. Glod.
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 49-55. 40 refs. In Russian.

Evaluation of the possible applications of pharmacology in space medicine and discussion of the requirements for drugs and medicine under the conditions of space flight. The two most important problems facing pharmacology in space medicine are the necessity of increasing the resistance of the organism to extreme conditions in flight and the need to determine the nature of the reaction of the organism to various drugs administered. The use of drugs in such a way as to maximize their potential for increasing the stability of the organism to accelerations, weightlessness, radiation, and hypoxia is discussed. Experimental results available in the literature are surveyed, and the effectiveness of certain treatments is discussed. The problem of the correct doses and proper application of the drugs is considered, and the possibility of using drugs to analyze the effects of specific flight factors is noted. T.M.

A68-42780 *
DETERMINING THE EFFECTIVENESS OF FRACTIONAL G LEVELS IN REDUCING CIRCULATORY DECONDITIONING OF SPACEFLIGHT CREWS - A NEW TECHNIQUE AND PRELIMINARY RESULTS.
A. B. Thompson (General Electric Co., Command Systems Div., Apollo Support Dept., Houston, Tex.), A. Graybiel, and D. B. Cramer (U.S. Naval Aviation Medical Center, Aerospace Medical Institute, Pensacola, Fla.).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 57-64. 11 refs.
NASA-sponsored research.
[For abstract see issue 01, page 18, Accession no. A67-11397]

A68-42781
LOWER BODY NEGATIVE PRESSURE AND CARDIOVASCULAR DECONDITIONING DURING SIMULATED WEIGHTLESSNESS.
P. M. Stevens (Kentucky, University, Lexington, Ky.).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 65-74.

Description of the development of a system by which the blood volume can be redistributed in a recumbent individual in a fashion analogous to that which occurs during quiet standing in a 1-g field. Various physiological measurements obtained during short and long term exposure to lower body negative pressure (LBNP) are presented. Cardiovascular measurements were done by transcutaneous right heart catherization utilizing the antecubital vein while the cardiac outputs were measured by the dye dilution technique. During LBNP, a 20 to 40% decrease in cardiac output occurred depending upon the amount of subatmospheric pressure used. Results indicate that the exposure to lower body negative pressure for only two days, at the end of a four to six-week period of complete bed rest is capable of not only repleting plasma volume, increasing body weight and decreasing orthostatic heart rate, but also prevents the increased incidence of orthostatic syncope. M.G.

A68-42782
ENSURING RADIATION SAFETY DURING THE FLIGHTS OF VOSKHOD AND VOSKHOD 2 [OBESPECHENIE RADIATSIONNOI BEZOPASNOSTI PRI POLETAKH KORABLEI "VOSKHOD" I "VOSKHOD-2"].
Iu. M. Volynkin, V. V. Antipov, B. I. Davydov, N. N. Dobrov, M. D. Nikitin, N. F. Pisarenko, and P. P. Saksonov (Akademiia Nauk SSSR, Moscow, USSR).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 75-80. 6 refs. In Russian.

Discussion of the measures taken to decrease the radiation hazard to the crew of Voskhod in general and to the cosmonaut Leonov during his space walk, in particular. These included: checking the radiation conditions along the planned orbit by an unmanned satellite one day before launching Voskhod 2; prediction of solar activity; decreasing the radiation dose by shielding the spacecraft; measuring the radiation level in the upper atmosphere by balloon probes; measuring the dose (and its energy) of integral radiation by an onboard radiometer; measuring the total dose of each cosmonaut with dosimeters and nuclear emulsions; performing biological dosimetry of cosmic radiation; and reducing the effect of the biological action of ionizing radiation in emergency situations by pharmacochemical preparations. The tabulated results show that the radiation doses experienced by the crews of Voskhod and Voskhod 2 were 30 and 65 mrad, respectively, and that the prediction that the dose experienced by Leonov during his walk in space would be greater due to the effect of soft-electron radiation was not confirmed. V.P.

A68-42783
THE EFFECT OF PROLONGED ACCELERATIONS ON GAS EXCHANGE AND RESISTANCE TO HYPOXIA IN RATS [O VLIIANII PRODOLZHITEL'NYKH USKORENII NA GAZOOBMEN I USTOICHIVOST' K GIPOKSII U KRYS].
A. A. Giurdzhian (Akademiia Nauk SSSR, Moscow, USSR).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 81-84. In Russian.

Description and results of an experiment performed on rats to investigate gas exchange during prolonged acceleration and the combined action of acceleration and hypoxia on life functions. The characteristics of gas exchange (the consumption of oxygen) during prolonged accelerations were determined by subjecting the rats to long periods of time inside a chamber attached to a centrifuge (6 hr to 2 days at 1.5-4 and 10 g). The rate of gas exchange was found to decrease under such conditions. To test the combined effect on gas exchange of prolonged acceleration and hypoxia, the rats were placed in a similar chamber, but with a reduced oxygen supply. It was found that the rats' resistance to fatal hypoxia was lowered during prolonged accelerations. P.G.M.

A68-42784 *
LUNEX II - A STUDY ON MANNED LUNAR EXPLORATION.
M. J. Vaccaro, H. Y. Grubbs (NASA, Marshall Space Flight Center, Huntsville, Ala.), S. Deutsch (NASA, Office of Advanced Research and Technology, Washington, D.C.), J. E. Haaland, and N. M. Burns (Honeywell, Inc., Aerospace and Defense Group, Systems and Research Div., Systems and Research Center, Minneapolis, Minn.).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 85-98. 10 refs.
[For abstract see issue 01, page 17, Accession no. A67-11392]

A68-42785
EYE SENSITIVITY UNDER HYPOXIA [LA SENSIBILITE OCULAIRE EN HYPOXIE].
M. P. Popescu, M. Stefan, D. Pavel, and N. Cincă (Centre Médical de l'Aviation, Institut Médico-Pharmaceutique, Chaire de Physiologie, Bucharest, Rumania).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 99-106. 19 refs. In French.

Investigation of the influence of hypoxia on the sensitivity of the eye. The study is based on clinical research performed with pilots and animal experiments carried out under various degrees of hypoxia. To measure the changes in the sensitivity of the cornea and the conjunctiva, the sensitivity threshold of diverse regions is established by means of an estesiometer. After exposure of the eyes to various states of hypoxia and influential environmental conditions, altitudes are plotted with pressure readings from the instrument for the variations of the sensitivity threshold. The resulting estesiograms are also represented graphically as age functions of the individuals under experiment. R.M.

A68-42786 *
EFFECTS OF COMBINED LINEAR AND VIBRATORY ACCELERATIONS ON HUMAN BODY DYNAMICS AND PILOT PERFORMANCE CAPABILITIES.
H. C. Vykukal and C. B. Dolkas (NASA, Ames Research Center, Moffett Field, Calif.).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 107-116. 7 refs.
[For abstract see issue 02, page 189, Accession no. A67-12409]

A68-42787
SPACE EXTRAVEHICULAR OPERATIONS - A REVIEW OF THE REQUIREMENTS AND ALTERNATE SYSTEM APPROACHES.

L. M. Seale (Bell Aerospace Corp., Bell Aerosystems Co., Buffalo, N.Y.) and P. N. van Schaik (USAF, Systems Command, Research and Technology Div., Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 119-137. 6 refs.
[For abstract see issue 01, page 18, Accession no. A67-11400]

A68-42788
INFORMATIONAL MODEL OF THE DYNAMICS OF MOTION, AND THE SPATIAL ORIENTATION OF AN ASTRONAUT OUTSIDE HIS SPACECRAFT [INFORMATSIONNAIA MODEL' DINAMIKI DVIZHENIIA I PROSTRANSTVENNAIA ORIENTIROVKA KOSMONAVTA VNE KORABLIA].
V. A. Popov, Iu. A. Rozanov, and M. M. Sil'vestrov (Akademiia Nauk SSSR, Moscow, USSR).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 139-145. In Russian.

Investigation of an informational model to study the problems of orientation and the dynamics of motion for an astronaut during extravehicular activity. From an experiment simulating such activity, it is found that the astronaut would need the following information (gathered by visual or electronic means): angular position relative to spacecraft, angular velocity, velocity relative to spacecraft, and distance from spacecraft. The use of hand jets to effect extravehicular activity is investigated. P.G.M.

A68-42790
PROBLEMS OF THE PROLONGED AUTONOMOUS EXISTENCE OF HUMANS IN SPACESUITS [K PROBLEME DLITEL'NOGO AVTONOMNOGO SUSHCHESTVOVANIIA CHELOVEKA V KOSMICHESKOM SKAFANDRE].
A. M. Genin and L. G. Golovkin.
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 159-164. In Russian.
[For abstract see issue 02, page 187, Accession no. A67-12324]

A68-42791
DESCRIPTION OF THE ASTRONAUT MANEUVERING UNIT.
G. M. Monroe (LTV Aerospace Corp., Astronautics Div., Dallas, Tex.) and W. C. McMillin (LTV Aerospace Corp., Astronautics Div., Astronaut Maneuvering Unit, Dallas, Tex.).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 165-174.

Flight evaluation of an AMU (astronaut maneuvering unit) now under development as part of the Gemini Experiments Program. This system is in essence a small spacecraft composed of a pressure suit, a chest pack life support system, and a back pack maneuvering unit. The chest pack contains the emergency oxygen supply, and all of the AMU systems-status and malfunction-detection displays. The back pack contains the propulsion, flight control, oxygen supply, power supply, malfunction detection, and communications system. The AMU permits not only extravehicular activity but also operations that require complete independence from the main vehicle. P.v.T.

A68-42792
ASSESSMENT OF THE SENSIBLE HEAT TRANSFER PROPERTIES OF CONDITIONED CLOTHING.
D. McK. Kerslake (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 175-181. 7 refs.
[For abstract see issue 02, page 188, Accession no. A67-12346]

A68-42793 *
EFFECTS OF DEHYDRATED, LIQUID, AND COMPRESSED FOODS AND ENVIRONMENT ON HUMAN WASTE AND WATER CONSUMPTION IN DEVELOPING LIFE SUPPORT SYSTEMS REQUIREMENTS.
A. R. Slonim (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Life Support Div., Wright-Patterson AFB, Ohio).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 183-192.
NASA Contract No. R-85; Contracts No. AF 33(657)-11716; No. AF 33(615)-2182.
[For abstract see issue 02, page 188, Accession no. A67-12339]

A68-42794
AN EVALUATION OF MAN'S CAPABILITY TO PERFORM SUPPORT FUNCTIONS IN SPACE.
C. B. May (USAF, Systems Command, Research and Technology Div., Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio) and A. E. Holmes (Martin Marietta Corp., Aerospace Group, Baltimore, Md.).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17th, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 193-204. 13 refs.
[For abstract see issue 01, page 18, Accession no. A67-11405]

A68-42795
HABITABILITY AND THE BIOTECHNOLOGICAL ASPECTS OF THE LIFE-SUPPORT SYSTEMS OF SPACECRAFT AND PLANETARY STATIONS [OBITAEMOST' I BIOLOGO-TEKHNICHESKIE ASPEKTY SISTEM ZHIZNEOBESPECHENIIA KOSMICHESKIKH KORABLEI I PLANETNYKH STANTSII].

B. A. Adamovich and Iu. G. Nefedov (Akademiia Nauk SSSR, Moscow USSR).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 205-212. In Russian.

Survey of the most important problems facing space biology and medicine in determining the requirements of life-support systems and creating an environment suitable for long-term human habitation of spacecraft. Particular attention is given to the importance of reliable, long-duration environmental protection systems. The nominal conditions required for a habitable human environment are outlined, and the corresponding technical requirements are examined. Various techniques proposed for reducing the stringent requirements of the environmental system are analyzed, with particular attention to partial or total usage of waste products. Human adaptation to the space environment results in certain changes in all of the different systems of the organism. The necessity of accounting for these changes is examined. T. M.

A68-42796
PRINCIPLES OF THE BIOMECHANICS OF HUMANS IN UNSUPPORTED POSITIONS [OSNOVY BIOMEKHANIKI CHELOVEKA V BEZOPORNOM POLOZHENII].
V. I. Stepantsov and A. V. Eremin (Akademiia Nauk SSSR, Moscow, USSR).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17th, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 213-217. In Russian.
[For abstract see issue 02, page 187, Accession no. A67-12325]

A68-42797 #
SPACECRAFT ATMOSPHERE SELECTION.
B. E. Welch (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Aerospace Medical Research Div., Environmental Systems Branch, Brooks AFB, Tex.) and W. G. Robertson (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Aerospace Medical Research Div., Sealed Environment Section, Brooks AFB, Tex.).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 221-236. 38 refs.
[For abstract see issue 02, page 187, Accession no. A67-12319]

A68-42798
PROBLEMS OF BIOTELEMETRY IN LONG SPACE FLIGHTS [PROBLEMY BIOTELEMETRII V DLITEL'NYKH KOSMICHESKIKH POLETAKH].
I. T. Akulinichev, A. M. Zhdanov, and I. I. Popov.
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 237-244. In Russian.
[For abstract see issue 02, page 187, Accession no. A67-12323]

A68-42799
HUMAN LIFE IN THE SPACE CABIN [VIDA HUMANA EN LA CABINA ESPACIAL].
L. R. Martos (Barcelona, Academia de Ciencias Médicas, Barcelona, Spain).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 245-250. In Spanish.

Discussion of problems which must be faced in manned space flight. Among these problems are: the effects of close confinement; control of oxygen, temperature, and pressure; shielding from cosmic radiation; protection from vibration and acceleration. P.v.T.

A68-42800 *
COMPUTER ASSESSMENT OF THE ELECTROENCEPHALOGRAM AS A MEASURE OF FATIGUE IN MAN AND SUB-HUMAN PRIMATES UNDER PARTIALLY SIMULATED CONDITIONS OF SPACE TRAVEL (NOT WEIGHTLESSNESS).
L. D. Proctor, W. R. McCrum, T. E. LeVere, and H. van den Ende (Henry Ford Hospital, Dept. of Neurology and Psychiatry, Detroit, Mich.).
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 251-263.
Contract No. NASr-83.

Evaluation of EEG data as a measure of fatigue induced in humans and monkeys by certain space-flight factors. Time techniques were devised so that a significant decrement (at least 20%) in performance appeared in 90% of Nemestrina monkey subjects during a 48 hr test period. A 25% to 30% decrement in performance occurred in 98% of human subjects during a 3 hr test period. The computer assessment of the EEG related to this decrement in performance presented one of the major problems in this investigation. There appears to be a consistent change in the EEG of Nemestrina monkeys consisting of an increase in theta and probably in alpha activity. In the group of 10 humans, all subjects showed a negative correlation between delta activity in the EEG and the increase in performance decrement. Interhemispheric EEG differences related to decremental performance require further investigation before this series would yield reliable statistical assessment. P.v.T.

A68-42801
OXYGEN BALANCE OF THE ORGANISM DURING PROLONGED ACCELERATIONS [KISLORODNYI BALANS ORGANIZMA PRI DLITEL'NYKH USKORENIIAKH].
A. S. Barer, G. A. Golov, V. B. Zubavin, E. I. Sorokina, and E. P. Tikhomirov (Akademiia Nauk SSSR, Moscow, USSR).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.

Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 265-274. 8 refs. In Russian.
[For abstract see issue 02, page 188, Accession no. A67-12329]

A68-42802
CONTROL OF TRACE CONTAMINANTS FROM CANDIDATE MATERIALS IN SPACE CABIN ATMOSPHERES.
P. P. Mader and E. S. Mills (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Advance Biotechnology and Power Dept., Life and Environmental Systems Branch, Santa Monica, Calif.).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 275-282.
Research supported by the Douglas Independent Research and Development Program.
[For abstract see issue 02, page 189, Accession no. A67-12388]

A68-42803
SIMULATION OF ENERGY-EXCHANGE PROCESSES IN ECOLOGICAL SYSTEMS [MODELIROVANIE PROTSESSOV ENERGOOBMENA V EKOLOGICHESKIKH SISTEMAKH].
A. B. Rubin (Akademiia Nauk SSSR, Moscow, USSR).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 283-286. In Russian.
[For abstract see issue 02, page 188, Accession no. A67-12327]

A68-42804
CERTAIN PROBLEMS CONCERNING THE ACTION OF G-FORCES IN SPACE FLIGHT - CUMULATIVE AND ADAPTIVE EFFECTS [NEKOTORYE PROBLEMY DEISTVIIA PEREGRUZOK V KOSMICHESKOM POLETE - EFFEKTY KUMULIATSII I ADAPTATSII].
A. R. Kotovskaia (Akademiia Nauk SSSR, Moscow, USSR).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 287-292. In Russian.
[For abstract see issue 02, page 188, Accession no. A67-12328]

A68-42805
A SPACE RADIATION MONITORING SYSTEM FOR SUPPORT OF MANNED SPACEFLIGHT.
D. E. Ewing (USAF, Kirtland AFB, N. Mex.).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 299-307.
[For abstract see issue 02, page 188, Accession no. A67-12387]

A68-42806
TRANSFORMATION OF HUMAN WASTE PRODUCTS AND THE BIOCOMPLEX TO MAINTAIN A LIFE CYCLE IN SMALL CLOSED SPACES [O TRANSFORMATSII PRODUKTOV ZHIZNEDEIATEL'NOSTI CHELOVEKA I BIOKOMPLEKSA PRI OSUSHCHESTVLENII KRUGOVOROTA VESHCHESTV V MALYKH ZAMKNUTYKH PROSTRANSTVAKH].
V. I. Iazdovskii, A. L. Agre, B. G. Gusarov, Iu. E. Siniak, S. V. Chizhov, and S. I. Tsitovich (Akademiia Nauk SSSR, Moscow, USSR).
(International Astronautical Federation, International Astronautical Congress, 17th, Madrid, Spain, Oct. 9-15, 1966, Paper.)
IN: LIFE IN SPACECRAFT; INTERNATIONAL ASTRONAUTICAL FEDERATION, INTERNATIONAL ASTRONAUTICAL CONGRESS, 17TH, MADRID, SPAIN, OCTOBER 9-15, 1966, PROCEEDINGS. VOLUME 5. [A68-42774 22-05]
Edited by Michał Łunc.
Paris, Dunod Editeur; New York, Gordon and Breach, Science Publishers, Inc.; Warsaw, PWN-Polish Scientific Publishers, 1967, p. 309-315. In Russian.
[For abstract see issue 02, page 187, Accession no. A67-12326]

A68-42866
INVESTIGATIVE STUDIES OF PLASMA TORCH HAZARDS.
Charles H. Powell, Marcus M. Key (National Center for Urban and Industrial Health, Cincinnati, Ohio), and Leon Goldman (Children's Hospital Research Foundation, Laser Laboratory, Cincinnati, Ohio).
American Industrial Hygiene Association Journal, vol. 29, July-Aug. 1968, p. 381-385. 14 refs.

Potential health hazards from a medium output plasma torch used in a biological laboratory were investigated, and some industrial applications of higher output plasma torches were surveyed. Exposures to intense UV radiation, noise, and noxious gases and fumes were measured. Biological experiments on animals and human skin were performed to evaluate the reaction to UV energy, and thermocouples were used to quantitate the thermal reaction of skin and eyes produced by the plasma torch. (Author)

A68-42935 *
AUTORADIOGRAPHIC LOCALIZATION OF RADIOACTIVITY IN RAT BRAIN AFTER INJECTION OF TRITIATED SEX HORMONES.
Donald W. Pfaff (Rockefeller University, New York, N.Y.).
Science, vol. 161, Sept. 27, 1968, p. 1355, 1356. 15 refs.
Research supported by John A. Hartford Foundation and AEC; Grant No. NsG-496.

Radioactivity was found in cell bodies of neurons and glial cells throughout brains of male and female rats that had been injected with either testosterone-H^3 or estradiol-H^3. Uptake by limbic and hypothalamic structures was higher and longer lasting than that in nonlimbic structures. In all brains, the preoptic area, prepiriform cortex, olfactory tubercle, and septum had particularly high, long-lasting uptake of both hormones. (Author)

A68-42936 *
INDUCTION OF COLLAGENOLYTIC AND PROTEOLYTIC ACTIVITIES IN RAT AND HUMAN FIBROBLASTS BY ANTI-INFLAMMATORY DRUGS.
J. C. Houck (Children's Hospital, Biochemical Research Laboratory, Washington, D.C.) and V. K. Sharma (George Washington University, Medical School, Dept. of Pediatrics, Washington, D.C.).
Science, vol. 161, Sept. 27, 1968, p. 1361, 1362. 17 refs.
Army-supported research; NIH Grant No. FR-00284; Grant No. NGR-09-134-001.

Experimental investigation of the ability of such antiinflammatory drugs as cortisol, indomethacin, and oxyphenylbutazone in inducing collagenolytic activities in rat and human fibroblasts. It is found that confluent monolayers of either mouse or diploid human fibroblasts contain no measurable amounts of either collagenolytic (pH 5.5) or proteolytic (pH. 7.5) activities. Within a few hours after exposure of these cells to antiinflammatory drugs, significant amounts of these enzymatic activities were observed outside the cells. These activities were greatly decreased in cultures which were simultaneously treated with the antiinflammatory drugs and cycloheximide or actinomycin D. P. G. M.

A68-43128
EXPERIMENTAL STUDIES IN SPACE PSYCHOPHYSIOLOGY.
V. V. Parin and F. D. Gorbov.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 7-12.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 4-8. 19 refs. Translation.
[For abstract see issue 13, page 2058, Accession no. A67-26751]

A68-43129
GASTROENTEROLOGIC FACTORS IN SPACE MEDICINE AND PHYSIOLOGICAL DIETARY REQUIREMENTS OF ASTRONAUTS.
I. M. Khazen.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 13-20.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 9-14. 39 refs. Translation.
[For abstract see issue 13, page 2058, Accession no. A67-26752]

A68-43130
LIFE-SUSTENANCE SYSTEMS FOR SPACECRAFT.
B. A. Adamovich and G. G. Tern-Minas'ian.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 20-29.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 15-21. 21 refs. Translation.
[For abstract see issue 13, page 2061, Accession no. A67-26753]

A68-43131
HABITABILITY OF SPACECRAFT.
Iu. G. Nefedov and S. N. Zaloguev.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 30-36.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 22-26. 19 refs. Translation.
[For abstract see issue 13, page 2061, Accession no. A67-26754]

A68-43132
INCREASE IN RADIATION RESISTANCE OF POTATOES UNDER CONDITIONS OF ANOXIA.
V. P. Dadykin, Iu. I. Shaidorov, D. F. Gertsuskii, I. S. Skukina, T. I. Nikishanova, I. V. Nikitina, and L. I. Finogenova.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 36-40.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 27-29. 19 refs. Translation.
[For abstract see issue 13, page 2058, Accession no. A67-26755]

A68-43133
CARDIAC CHANGES IN HYPOXIA - EXPERIMENTAL MORPHOLOGICAL INVESTIGATION.
V. V. Portugalov, O. G. Gazenko, V. B. Malkin, A. S. Kaplanskii, G. N. Durnova, E. I. Il'ina-Kakueva, and I. B. Krasnov.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 40-45.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 30-33. 17 refs. Translation.
[For abstract see issue 13, page 2058, Accession no. A67-26756]

A68-43134
NEUROREFLEX MECHANISMS FOR REGULATION OF HEMODYNAMIC CHANGES DURING RAPIDLY AND SLOWLY INCREASING ACCELERATION.
E. B. Shul'zhenko.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 45-49.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 34-36. 6 refs. Translation.
[For abstract see issue 13, page 2058, Accession no. A67-26757]

A68-43135
REACTION OF INDIVIDUAL NEURONS IN THE VISUAL REGION OF THE CAT CORTEX TO STIMULATION OF THE VESTIBULAR APPARATUS.
M. G. Kutateladze.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 49-52.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 37-39. 13 refs. Translation.
[For abstract see issue 13, page 2058, Accession no. A67-26758]

A68-43136
SYNTHESIS OF TISSUE PROTEINS IN ANIMALS UNDERGOING HYPODYNAMIA.
I. V. Fedorov, V. N. Vinogradov, Iu. I. Milov, and L. A. Grishanina.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 53-57.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 40-43. 8 refs. Translation.
[For abstract see issue 13, page 2059, Accession no. A67-26759]

A68-43137
PROBLEMS OF ACCELERATION IN SPACE PHYSIOLOGY.
A. S. Barer.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 57-64.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 44-48. 12 refs. Translation.
[For abstract see issue 13, page 2059, Accession no. A67-26760]

A68-43138
ENSURING RADIATION SAFETY IN SPACE FLIGHTS - RADIOBIOLOGICAL ASPECTS.
Iu. G. Grigor'ev and E. E. Kovalev.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 64-69.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 49-52. Translation.
[For abstract see issue 13, page 2059, Accession no. A67-26761]

A68-43139
USE OF ON-BOARD COMPUTERS FOR MEDICAL SUPERVISION AND RESEARCH IN COSMIC FLIGHT.
R. M. Baevskii.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 69-75.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 53-57. 11 refs. Translation.
[For abstract see issue 13, page 2062, Accession no. A67-26762]

A68-43140
SOME PROBLEMS INVOLVED IN THE SELECTION OF SCIENTIST ASTRONAUTS.
P. I. Egorov, G. P. Mikhailovskii, M. M. Korotaev, T. V. Benevolenskaia, N. M. Boglevskaia, T. N. Krupina, I. A. Maslov, T. A. Petrova, and I. Ia. Iakovleva.

(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 75-78.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 58-60. 7 refs. Translation.
[For abstract see issue 13, page 2062, Accession no. A67-26763]

A68-43141
PREVENTION OF THE ADVERSE EFFECTS OF HYPOKINESIA ON THE HUMAN CARDIOVASCULAR SYSTEM.
P. V. Buianov, A. V. Beregovkin, and N. V. Pisarenko.
(Kosmicheskaia Biologiia i Meditsina, vol. 1, Jan.-Feb. 1967, p. 78-82.)
Environmental Space Sciences, vol. 1, Jan.-Feb. 1967, p. 61-64. Translation.
[For abstract see issue 13, page 2059, Accession no. A67-26764]

A68-43219 #
STUDY OF WATER REGENERATION BY HIGHER PLANTS GROWN IN A CLOSED VOLUME [IZUCHENIE REGENERATSII VODY VYSSHIMI RASTENIIAMI PRI VYRASHCHIVANII IKH V ZAMKNUTOM OB'EME].
M. M. Bokovaia, Iu. S. Koloskova, N. T. Nilovskaia, and S. V. Chizhov.
IN: PROBLEMS OF CREATING CLOSED ECOLOGICAL SYSTEMS [PROBLEMY SOZDANIIA ZAMKNUTYKH EKOLOGICHESKIKH SISTEM].
Edited by A. A. Nichiprovich and G. M. Lisovskii.
Moscow, Izdatel'stvo Nauka, 1967, p. 119-124. 11 refs. In Russian.

Study of the suitability of a group of vegetables as a drinking-water source in life support systems. Plants of two species each of cabbage, sugar beets, and beans, and one species each of lettuce, radish, peas, soybeans, carrots, and potatoes were grown for 1 to 2 months on nutritive media. The plants were then exposed for 3 to 12 days to 300 W/m^2 18-hr daily light from incandescent lamps at 24 ± 2°C and humidity of 80 ± 10%, in an airtight chamber with a cooled water vapor condenser. The amount of the water condensate collected varied from 19.3 (lettuce) to 40.6 (cabbage) gr/hr for 1 m^2 of foliage area, or from 1208 (peas) to 2580 (cabbage) gr/day for 1 m^2 of planted area. It was lower by roughly a factor of 2.7 when the illumination level was reduced from 300 to 50 W/m^2 in experiments with cabbage. (ATD/LC)

A68-43220 *
UTILIZATION OF EXCRETORY PRODUCTS OF CHLORELLA PYRENOIDOSA BY SELECTED BACTERIA.
H. C. Smith, H. E. Brown (Technology, Inc., San Antonio, Tex.), J. E. Moyer, and C. H. Ward (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).
Developments in Industrial Microbiology, vol. 9, 1968, p. 363-369. 12 refs.
NASA Contracts No. R-99; No. R-44-014-006.

Four bacteria isolated as contaminants from algal mass cultures utilized most of the organic compounds present in axenic algal culture filtrates. Typical and atypical strains of Bacterium anitratum utilized amino acids to about the same extent; however, only the atypical strain utilized both lactic acid and glycolic acid. Mima polymorpha failed to use either of the organic acids, but a gram negative bacillus utilized all of the lactic acid and apparently excreted glycolic acid. Amino acids were utilized to a greater extent than organic acids. In general, the combined activities of the four bacteria served to essentially eliminate all products excreted during algal growth. Ecological implications of algal-bacterial associations in natural and artificial environmental systems are considered. (Author)

A68-43222 *
METABOLIC AND THERMAL RESPONSES OF MAN IN VARIOUS $He-O_2$ AND AIR ENVIRONMENTS.
Richard W. Bowers and Edward L. Fox (Ohio State University, Dept. of Physical Education, Columbus, Ohio).
Journal of Applied Physiology, vol. 23, Oct. 1967, p. 561-565. 17 refs.
Research supported by the Ohio State University; Grants No. NsG-295; No. NsG-36-008-004.

Metabolic and thermal responses of resting man were studied for 2 hr while breathing and/or immersed in a $He-O_2$ mixture or air in a comfortable thermal environment. The gaseous combinations were: (1) air breathing, air immersion; (2) $He-O_2$ breathing, air immersion; (3) air breathing, $He-O_2$ immersion; and (4) $He-O_2$ breathing, $He-O_2$ immersion. Changes in mean skin temperature ($T_{\bar{s}}$) and rectal temperature (T_r) were found only between the trials in which the subjects were immersed in air or $He-O_2$, and were independent of the gases breathed. These changes were lower $T_{\bar{s}}$ ($P < .01$) and T_r ($P < .001$) in the $He-O_2$-immersion trials implying that He promotes body cooling solely because of its relatively high thermal conductivity. Oxygen consumption was independent of the immersion gases and those breathed as were heart rate, pulmonary ventilation, and respiratory exchange ratio. These results indicate that in man in a comfortable thermal environment, He neither induces metabolic alterations at the cellular level, nor does the accelerated heat loss stimulate heat production measurably in 2 hr of exposure. (Author)

LC ENTRIES

A68-82015
THE PERCEPTION AND EVALUATION OF TIME [K VOPROSU O VOSPRIIATII I OTSENKE VREMENI].
A. S. Dmitriev and G. S. Karpov (Bashkir U., Dept. of Human and Animal Physiol., Ufa, Russia).
Voprosy Psikhologii, v. 13, Jul.–Aug. 1967, p. 90–101. 23 refs. In Russian.

Subjective time estimation by adults (17–27 yr. of age) in different conditions was investigated by the production method. The experiments showed that after the acquisition of time conditioned reflex (60 sec. interval) the accuracy of subjective estimation of 60 sec. interval as well as 15- and 90-sec. interval increased. A special training in subjective time estimation, when the subject was correctly informed about the accuracy of his estimations, significantly increased the accuracy of estimations (to a greater extent than after the acquisition of time conditioned reflex). False information, irrespective of the accuracy of estimations led to sharp changes in the character of subjective estimations. The influence of false information was retained in the form of after-effects in the subsequent experiments even when the correct information was given. In experiments with false information the clear-cut emotional strain appeared in all subjects in connection with the increasing doubt in the correctness of the external information. Despite the false information, some subjects were capable of making their subjective estimations more accurately. Obviously, this was connected (due to the emotional strain) with the use of some other internal information about the accuracy of estimations which played before a secondary role. On the basis of experimental data it was inferred that the second signal system played a dominant role in the perception and estimation of time.

A68-82016
AN EXPERIMENTAL DEVICE TO STUDY CHARACTERISTICS OF VISUAL PERCEPTION OF TEST-OBJECTS IN THREE DIMENSIONAL SPACE [EKSPERIMENTAL'NAIA USTANOVKA DLIA IZUCHENIIA OSOBENNOSTEI ZRITEL'NOGO VOSPRIIATIIA TEST-OB"EKTOV V TREKHMERNOM PROSTRANSTVE].
V. I. Butov and V. S. Ovchinnikov (Lab. of Eng. Psychol., Leningrad, USSR).
Voprosy Psikhologii, vol. 13, Jul.–Aug. 1967, p. 147–152. In Russian.

A detailed description of a stereoscopic visual testing device was presented. This apparatus would allow study of the processes involved in detection, localization, and discrimination of visual targets and matching of test-objects with a movable sighting device. The device consisted of two basic sections, a testing apparatus presenting and displaying the test objects, and an automatic control unit providing a selection of different tests, collection of test programs, and recording the subject reaction time and errors.

A68-82017
AN INFORMATION MODEL DISPLAYING THE PROCESS INVOLVED IN PILOTING PLANES [OB INFORMATSIONNOI MODELI DLIA OTOBRAZHENIIA PROTSESSA PILOTIROVANIIA SAMOLETA LETCHIKOM].
L. I. Vinograi.
Voprosy Psikhologii, v. 13, Jul.–Aug. 1967, p. 153–159. In Russian.

A study was made of the motions performed during banking in a turn in a series of experimental flights conducted in Migs 17 equipped with data units and loop oscilloscopes. Fifteen pilots took part in the experiments. The flights schedule provided for standard aerial maneuvers (dives, spins, zooms etc.) at different speed and altitude. The displacements of the controls and the resulting aircraft motions were recorded. The system variables obtained were mathematically analyzed and evaluated. The premises for developing and exploiting the information model tested could be used not only to construct visual display indicators but also to construct automatic devices for the objective evaluation of pilot proficiency.

A68-82018
LIFE IN SPACE.
W. F. Libby (Calif., U., Inst. of Geophysics and Dept. of Chem., Los Angeles).
Space Life Science, vol. 1, Mar. 1968, p. 5–9.

The physical conditions of Space are most inhospitable and the higher forms of life probably could exist extraterrestrially only on Venus, Jupiter, and Saturn in our Solar System, and the chances there are poor in light of present knowledge. Thus intelligent life probably exists only on the Earth. Although indigenous intelligent extraterrestrial life seems to be improbable it is by no means clear that man cannot learn to live reasonably comfortably on most of our planets and planetoids such as our moon, and it seems certain that he will be able to travel great distances in the solar system. Lower forms of life may well occur extraterrestrially.

A68-82019
BIOCHEMICAL DIMENSIONS OF SPACE BIOLOGY.
Joseph F. Saunders (NASA, Office of Space Sci. and Appl., Biosci. Program, Washington, D.C.).
Space Life Sciences, vol. 1, Mar. 1968, p. 10–22. 39 refs.

A review and evaluation of current research involving experimental and theoretical studies of biological reactions to abnormal environmental conditions. Among the questions discussed were the effects of weightlessness, radiation, and acceleration on the biological systems, and the changes resulting from actual space flights in the hematologic, cardiovascular, central nervous, and musculoskeletal systems. Biochemical systems are also discussed in relation to space flight stress. The need for a closer union of disciplines to provide bases for ways and means of protecting biochemical and physiological activity of living organisms from space hazards was stressed. Many questions were still unanswered, and further work to achieve the maximum collection of reliable data was required before any definite conclusions could be made.

A68-82020
SPACE BIOMAGNETICS.
Douglas E. Busby (Lovelace Found. for Med. Educ. and Res., Albuquerque, N. Mex.).
Space Life Sciences, vol. 1, Mar. 1968, p. 23–63. 148 refs.
NASA Contract NASr-115.

Astronauts who venture from their spacecraft onto the lunar surface and the surfaces of our neighboring planets will be exposed for a few hours in duration to magnetic-field intensities which are markedly less than that of the earth's field. The intensities of magnetic fields to which they will be exposed while inside their spacecraft can be stated only after completing a detailed survey of the contribution made to these fields by the functioning electronic

components of spacecraft. Assessment of individuals regularly working in and exposed continuously for ten days to magnetic fields less than 100 gammas in intensity indicate that extremely low-intensity magnetic fields encountered during a nominal Appollo moon mission should not affect astronaut health or performance. Careful physiological and psychological observations first on higher primates, then on man exposed to such fields for more prolonged periods of time must be carried out before this conclusion can be drawn for longer exposures. Recent technological advances in propulsion and radiation protection have made it possible that astronauts might also be exposed intermittently to high-intensity, relatively low-gradient magnetic fields during space missions. The duration of such exposures could range from less than an hour if an activated magnetohydrodynamic engine must be serviced, to several days if pure magnetic or plasma-radiation shielding is used for astronaut protection from solar flare radiation.

A68-82021
CURRENT STATUS OF CHEMICAL STUDIES ON THE ORIGIN OF LIFE.

Cyril Ponnamperuma and Norman W. Gabel (NASA, Ames Res. Center, Exobiol. Div., Moffett Field, Calif.).

Space Life Sciences, vol. 1, Mar. 1968, p. 64–96. 169 refs.

A discussion was presented on the origin of life from the standpoint of evolution of inorganic, organic and biologic material necessary for the formation and support of living organisms. The chemistry and conditions possibly prevalent on the primitive earth were described and the experimental studies on the synthesis of basic organic compounds such as amino acids, purines and pyramydines, monosaccharides, nucleic acids, proteins, etc., from simple inorganic processes were reviewed. The possibility of extraterrestrial life was discussed. Further work and understanding of the chemical basis for evolution would be needed, the most important problem would be the precellular organization because it bridged the gap between chemical and biological evolution.

A68-82022
PROGRAM FOR THE STUDY OF LONG-TERM ADAPTATION TO A WEIGHTLESS ENVIRONMENT PROVIDING THREE-DIMENSIONAL FREEDOM OF MOVEMENT.

J. P. Meehan and J. P. Henry (Southern Calif., U., Dept. of Physiol., Los Angeles).

Space Life Sciences, vol. 1, Mar. 1968, p. 97–112. 20 refs.
Contract AF F29600-67-C-0010 and NASA supported research.

The mechanical details of a working model of a proposed small-animal space station which is currently undergoing bench tests are briefly described together with supporting evidence pointing to the feasibility of the program. The one-third cubic meter canister weighs less than 250 kg. when loaded for a nine mo. period. It would transmit by slow-scan television data concerning mice which it is proposed would be born in the weightless state. Observation of their silhouettes would indicate their growth rates and study of the picture sequence their activity patterns. For example, their use and defense of the feeding and nesting areas and their care of their young. The device would also be used to determine whether the weightless state affected the development of a circadian rhythm or the periodicity of any rhythm that was observed. Recovery of the animals' special living compartment by rendezvous in orbit would permit testing of those born in the device in the earth's gravity field by familiar methods such as those that have been used for the assessment of negative geotactic responses and for the evaluation of rodents living in vertical, as opposed to horizontal mazes.

A68-82023
THE RESPONSE OF SPORE-FORMING VS. NONSPORE-FORMING BACTERIA TO DIURNAL FREEZING AND THAWING.

R. S. Young, P. H. Deal, and O. Whitfield (NASA, Ames Res. Center, Exobiol. Div., Moffett Field, Calif.).

Space Life Sciences, vol. 1, Mar. 1968, p. 113–117. 6 refs.

Experiments were done to determine the differential survival of micro-organisms under diurnal freeze-thaw conditions. Known species of bacteria and fungi, as well as unidentified organisms were subjected to diurnal freeze-thaw cycling and the effect on growth and survival noted. The temperature was cycled so that the organisms had about 4.5 hr. daily of exposure to temperature of 25° C. The remainder of the time was spent in dry ice at -70° C. Results indicated that spore-forming organisms had very little resistance to freeze-thaw conditions, as compared to nonspore formers. The spore-forming bacteria were generally incapable of growth under the freeze-thaw conditions employed although the ungerminated spores might withstand prolonged exposure to such an environment. It was suggested that vegetative cells of spore-forming organisms were more susceptible to freezing and thawing than were cells of nonspore-forming organisms. Further experiments showed that spore-forming organisms could under some conditions, grow in a Martian freeze-thaw environment. The potential hazard of contaminating the Martian environment with spore-forming organisms could not be ruled out if they would be carried to Mars on a spacecraft.

A68-82024
SURVIVAL OF MICRO-ORGANISMS IN SPACE.

Peter R. Lorenz, John Hotchin (N. Y. State Dept. of Health, Div. of Labs. and Res., Albany), Aletha S. Markusen, Curtis L. Hemenway (N. Y., State U., Albany), Gert B. Orlob (S. Dak. State U., Brookings), and Douglas S. Hallgren (Dudley Obs., Albany, N. Y.).

Space Life Sciences, vol. 1, Mar. 1968, p. 118–130. 8 refs.
NASA Grant NsG 155-61 and NASA Contract NAS 9-5637.

Dried suspensions of *Penicilium roqueforti* Thom, Coliphage T-1, *Bacillus subtilis* and tobacco mosaic virus were exposed to space on board the Gemini-IX-A and XII earth satellites and the Agena-VIII space rocket. All micro-organisms tested survived the direct exposure during the Gemini-IX-A experiment. In the Gemini-XII experiment only the T-1 phage survived the direct exposure. The survival was influenced by the suspending medium and depended on the species of the micro-organism. After four mo. of space flight on the Agena-VIII space rocket surviving fractions between 2×10^{-3} and 1.0 were found in the unopened flight container. However, micro-organisms exposed on the cover of the container during this period were completely inactivated. Shielding against solar ultraviolet radiation during flight resulted in survival of micro-organisms exceeding to that of the transport controls, and the survival was considered complete. Sterile methylcellulose collection surfaces were exposed to space on board the Gemini-IX-A and XII satellites in an attempt to collect viable micro-organisms in space. None of the collection surfaces yielded viable micro-organisms.

A68-82025
BIOCHEMICAL ACTIVITY AND WATER: THE ACTIVITY OF HEME ENZYMES IN NON-AQUEOUS MEDIA.

S. M. Siegel and Karen Roberts (Hawaii, U., Dept. of Botany, Honolulu and Duke U., Dept. of Botany, Durham, N. C.).

Space Life Sciences, vol. 1, Mar. 1968, p. 131–134. 7 refs.
NASA supported research.

The notion that enzymes could retain their catalytic properties in modified solvent media was investigated. The activity of two heme enzymes, peroxidase and catalase were studied; the first quantitatively and the second qualitatively. Peroxidase was active in

all protonic solvents tests, while aprotic solvents supported only nitromethane activity. Catalase being more sensitive to solvent medium, was nevertheless active in three alcohols. It was inferred that some enzymes of biochemical significance could remain operational in modified states. Further experimentation was suggested.

A68-82026
A MULTI-STAGE DECISION MODEL FOR MISSION NON-CONTAMINATION REQUIREMENTS.
C. A. Trauth, Jr. (Sandia Lab., Albuquerque, N. Mex.).
Space Life Sciences, vol. 1, Mar. 1968, p. 135–149. 13 refs.

There is apt to be much uncertainty in any program of planetary exploration. This uncertainty naturally leads to possible uncertainty in the time period in which planetary quarantine is desirable, to possible uncertainty in the total number of missions to be launched in the vicinity of any given planet, and indeed, to possible uncertainty in the meaning of the word "contamination". A model is developed in this paper which makes possible the derivation of mission non-contamination requirements without *a priori* knowledge of either the time period in which planetary quarantine is to be observed or the total number of missions to be used in exploring the planet being quarantined. On the basis of this model, some general observations are made about the need for carefully defining "contamination".

A68-82027
ON LOGARITHMIC EXTRAPOLATION OF MICROBIAL SURVIVOR CURVES FOR PLANETARY QUARANTINE REQUIREMENTS.
J. P. Brannen (Sandia Lab., Planetary Quarantine Dept., Albuquerque, N. Mex.).
Space Life Sciences, vol. 1, Mar. 1968, p. 150–152. 6 refs.
NASA Contract R-09-019-040 and AEC supported research.

A model based on clinical reaction kinetics in which non-logarithmic survival is inherent in the organism was briefly described, and the results obtained were compared with data for *Bacillus coagulans*. It seemed that the questions regarding the logarithmic extrapolation of microbial survival curves over non-measurable ranges to obtain thermal sterilization cycles for spacecraft applications might have a sound rational basis.

A68-82028
CHANGES OF THE EXTERNAL RESPIRATION IN SODIUM FLUORACETATE POISONING IN WHITE RATS [IZMENENIE VNESHNEGO DYKHANIIA U BELYKH KRYS PRI OTRAVLENII FTORATSETATOM NATRIIA].
V. A. Artiushkova, M. V. Kirzon, and G. G. Chernova (M. V. Lomonosov Moscow State U., USSR).
Biologicheskie Nauki, no. 4, 1968, p. 29–33. 12 refs. In Russian.

Experiments conducted on 40 rats showed that during sodium fluoracetate poisoning in doses of five mg./kg. three stages of respiratory disturbances could be observed. Electromyograms of the rats respiratory muscles were recorded during the investigation. During the first stage there was an increase in respiratory rates followed by a decrease. In the second the disturbances observed were characterized by arrhythmia, apnea, stopping and irregularities in the respiration. During the third stage there was a decrease in respiratory rate and volume, and intermittent spasmodic breathing. Death occurred during the second or third stage. The results showed that during sodium fluoracetate poisoning the respiratory center (RC) activity underwent changes, that could be due in the first stage to chemoreceptor reflexes, in the second stage to impulses starting in the higher part of the cerebral cortex, impinging on the RC and causing spasms, and in the third stage to the decrease in body temperature and deep disturbances in the RC cell metabolism.

A68-82029
SPACE SYSTEMS TECHNOLOGY.
Edited by Regis D. Heitchue, Jr. (McDonnell Douglas Corp., Missile and Space Systems Div., Advan. Space Sta. Dept., St. Louis, Mo.). New York, Reinhold Book Corp., 1968, x+300 p. Many refs.

Written primarily for the system engineer and manager this book is as accurate and current as possible. Physical fundamentals rather than technology are stressed. The subjects were picked because of their basic importance and frequent use in space systems. Chapters are devoted structures and materials, flight control, propulsion life support systems, secondary power conversion systems and communications.

A68-82030
JUDGMENTS OF DISTANCE UNDER PARTIALLY REDUCED CUES.
S. M. Luria and Jo Ann S. Kinney (Naval Submarine Med. Center, Groton, Conn.).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1019–1028. 23 refs.

This study tested the effects of emptiness of space and contrast on estimates of distance. Judgments of the distance of four in. square targets were obtained: (1) in well lit, everyday surroundings, (2) in the middle of a large, featureless gymnasium; and (3) under almost completely reduced cues. Distances were accurately estimated under the first condition and were increasingly overestimated in the latter two conditions. Distance-estimates obtained as a function of target-contrast, however, were somewhat inconclusive, although most subjects tended to judge the low-contrast target to be farther away. There appeared, however, to be an interaction effect–particularly with the white surround–such that subjects who judged distant targets to be farther away when they were of low contrast, tended to judge nearby targets farther away when they were of high contrast, and vice-versa.

A68-82031
MOTOR SKILLS BIBLIOGRAPHY: 91. PSYCHOLOGICAL ABSTRACTS, 1967, VOLUME 41, FIRST QUARTER.
R. B. Ammons and C. H. Ammons (Mont., U., Missoula).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1031–1034. 96 refs.

Ninety-six references to research on skills are listed alphabetically.

A68-82032
COGNITIVE STYLES OF VISUAL PERCEPTION IN THE EVALUATION OF TELEVISION SYSTEMS.
R. G. Merrill (Com., Dept., Environ. Sci. Serv. Admin., Aeronomy Lab., Boulder, Colo.) and D. R. Metcalf (Colo., U., Med. Center, Dept. of Psychiat., Div. of Electroencephalography, Denver).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1043–1046. 6 refs.

Subjective evaluations of television systems are usually avoided because they involve individual differences that are considered unpredictable and uncontrollable. The psychological concept of visual cognitive styles can lead to measures of individual differences in visual perception and therefore give insight into the nature of the human information-handling system. Evaluation of cognitive styles can therefore provide psychological controls in the

interpretation of subjective evaluations of television systems; they may also provide guidance for solutions of the television bandwidth reduction problem.

A68-82033
PERCEPTUAL CORRELATES OF THE ROD-AND-FRAME TEST.
Greta Adevai, Albert J. Silverman, and W. Edward Mc Gough (Rutgers Med. School, Dept. of Psychiat., New Brunswick, N.J.).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1055–1064. 20 refs
Grant PHS MH 08804.

A randomly selected group of 92 male college students were given a battery of ten perceptual tests, most of which have been used to separate field-independents from field-dependents in earlier studies of relationships between perceptual mode and physiological response tendencies. Test scores were factor analyzed in an attempt to define the psychological domain measured. Four factors accounted for most of the test score variance; the embedded figures test, sharing much of its variance with quantitative-spatial IQ tests, was the test with least of its variance accounted for. The rod-and-frame test, core test for field-dependence, correlated best with mirror-tracing speed, mirror-tracing accuracy, and the embedded figures test and had small or moderate positive correlations with all of the other tests except letter discrimination, which showed little relationship to any other test. Subject-controlled rod-and-frame correlated highly with experimenter-controlled rod-and-frame, suggesting their interchangeability as measures of field-dependence. Subjects with rod-and-frame errors of 1.5° or less did significantly better on the rest of the perceptual battery than subjects with errors of 8° or more. The embedded-figures test and the Draw-A-Person test were especially divergent for the two extreme rod-and-frame groups, suggesting their efficacy as screening devices for extreme field-dependents and independents.

A68-82034
NEAR AND FAR VISUAL ACUITY IN RHESUS MONKEYS (MACACA MULATTA).
Ernest S. Graham, Gary W. McVean (Wash. State U., Pullman), and Donald N. Farrer (6571st Aeromed. Res. Lab., Holloman AFB, N. Mex.).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1067–1072. 11 refs.
Contract AF 29(600)-67-C-0024 and U.S. Defense Atomic Support Agency supported research.

Measures of monocular and binocular subjective visual acuity were obtained for five rhesus monkeys *(Macaca mulatta)* at both near (three ft.) and far (20 ft.) viewing distances. The visual acuity stimuli were Landolt rings which had gap-openings varying between 0.5 and 2.0 min. of arc. No differences were found between the near and far acuity of the five subjects. Binocular acuity was superior to monocular acuity.

A68-82035
RELATIONSHIPS AMONG CHRONOLOGICAL AGE, INTELLIGENCE, AND RATE OF SUBJECTIVE TIME.
James J. McGrath and James F. O'Hanlon, Jr. (Human Factors Res., Inc., Santa Barbara, Calif.).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1083–1088. 7 refs.
Contract DA-49-193-MD-2743.

Relationships among 48 subjects' ages and IQs and their rates of subjective times (RST) were examined. A strong positive correlation was obtained between age and RST. In general the older the man, the faster was his RST. The strength of this relationship did depend, however, upon the interval of time the subject was required to estimate for the determination of his RST. In general, the shorter the interval the stronger was the relationship. No relationship was found between IQ and RST.

A68-82036
INDIVIDUAL DIFFERENCES IN AUDITORY REACTION TIME AND LOUDNESS ESTIMATION.
James T. Reason (Leicester, U., Great Britain).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1089–1090.

Three measures were computed for each of 32 undergraduate subjects: (1) the rate at which simple reaction time (RT) to auditory stimuli decrease with sound-intensity; (2) the rate at which numerical estimates of loudness increase over the same stimulus range; and (3) the mean of 60 RT to a 70-db. auditory stimulus. A significant rho of .45 was found between the slopes of the RT and loudness functions, but neither slope value was significantly related to the mean RT.

A68-82037
PICTORIAL DEPTH PERCEPTION AND EDUCATION AMONG BAGANDA SCHOOL CHILDREN.
Philip L. Kilbride, Michael C. Robbins, and Robert B. Freeman, Jr. (Pa. State U., University Park).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1116–1118.
Grant NIMH MH 10,691-04; Natl. Sci. Found. and Agr. Develop. Council, Inc. supported research.

Relative amount of pictorial perception of depth among rural Baganda school children was directly related to amount of formal education. Use of superimposition as a cue to pictorial depth perception appeared to be less dependent on education than object size and perhaps other cues.

A68-82038
BIBLIOGRAPHY OF SENSORY AND PERCEPTUAL DEPRIVATION, ISOLATION, AND RELATED AREAS.
Sidney Weinstein, Larry Fisher, Milton Richlin, and Marvin Weisinger (New York Med. Coll., N. Y.).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1119–1163. 1199 refs.
NASA Grants NsG-489 and NASA SC-33-145-(001).

This 1,199-item bibliography is concerned with the general topics of sensory and perceptual deprivation, isolation, relative restriction of sensory input, brain-washing, life in isolated outposts, submarines, and related areas.

A68-82039
PERSPECTIVE REVERSAL RATES AND REPORTS OF AN ATTRIBUTE OF APPARENT DEPTH IN A FLAT STIMULUS.
Roy B. Mefferd, Jr., Peter K. Leppmann, and Betty A. Wieland (Veterans Admin. Hosp., Psychiat. and Psychosomat. Res. Lab., Houston, Tex.).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1164–1166. 9 refs.

Subjects who reported that the two equal-sized faces of a Necker cube appeared to be of the same size had significantly lower perspective reversal rates than those who reported that the "near" face appeared to be smaller than the "far" face. It was suggested that subjects who failed to report an apparent size difference may fail to perceive depth in the cube and that this is reflected in their low perspective reversal rates.

A68-82040
VALIDITY OF PERCEPTUAL REPORTS OF EXPERIENCED AND INEXPERIENCED OBSERVERS.
Peter K. Leppmann and Roy B. Mefferd, Jr. (Veterans Admin. Hosp., Psychiat. and Psychosomat. Res. Lab., Houston, Tex.).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1167–1172. 8 refs.

Under identical instructions for passive viewing, rates of reversal of a reversible figure reported by 10 subjects practiced in describing their perceptual experiences were compared with those made by 14 subjects who were inexperienced in perceptual reporting. All subjects were naive with respect to the hypothesis to be tested, and further precautions were taken to mask the purpose of the experiment. In order to establish a set to "see" reversals, three ambiguous reversible figures were presented before the test figure which was similar to the last ambiguous figure in the series but was actually unambiguous and nonreversible. The inexperienced subjects generally did not overcome the set to "see" reversals, while most of the experienced subjects did so. Distraction in the form of noise did not influence the latter, but it increased the effect of the set on the inexperienced subjects.

A68-82041
MOTOR SKILLS BIBLIOGRAPHY: 92. PSYCHOLOGICAL ABSTRACTS, 1967, VOLUME 41, SECOND QUARTER.
C. H. Ammons and R. B. Ammons (Mont., U., Missoula).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1187–1190. 99 refs.

Ninety-nine references to research on skills are listed alphabetically.

A68-82042
SEX DIFFERENCES IN ROTARY PURSUIT PERFORMANCE OF YOUNG CHILDREN: A FOLLOW-UP.
Stephen H. Davol and Susan L. Breakell (Mt. Holyoke Coll., South Hadley, Mass.).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1199–1202. 9 refs.
Grant PHS MH 12613-01.

A 30-r.p.m. or a 45-r.p.m. rotary pursuit task was given to 72 boys and 72 girls from grades one to five of a lower-class and a middle-class school; each subject was given five 125-sec. trials with a one-min. rest period between trials. Analyses of time-on-target showed a different pattern of results for each school. No significant sex differences were found except through interaction with sex of E. Level of performance was determined primarily by speed of rotation and grade level of the subject but there was a lag in performance of subjects from the first two grades of the lower-class school.

A68-82043
SOME EFFECTS OF DISPLAY SYMBOL VARIATION UPON OPERATOR PERFORMANCE IN AIRCRAFT INTERCEPTION.
Meredith Munns (U.S. Naval Air Develop. Center, Aerospace Med. Res. Lab., Johnsville, Warminster, Pa.).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1215–1221.

A human factors experiment was conducted using a simulated military display, resembling a radar display tube, to determine the effect upon operator's performance of varying certain aspects of the displayed symbols. Color was added (a redundant coding dimension) as well as extra irrelevant symbols and their effects upon the operator's ability to make aircraft intercepts were measured. The results have application to tactical data systems and any other military systems where a large quantity of data must be presented for the observer's immediate assimilation and use.

A68-82044
PERCEPTION BIBLIOGRAPHY: 58. PSYCHOLOGICAL ABSTRACTS, 1940, VOLUME 14.
R. B. Ammons and C. H. Ammons (Mont., U., Missoula).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1223–1226. 121 refs.

One-hundred-twenty-one references to perception research are listed alphabetically.

A68-82045
EFFECT OF ANGLE OF RETINAL VISION ON THE RATE OF FLUCTUATION OF THE NECKER CUBE.
James G. Dugger (Drake U., Des Moines, Iowa) and Ronald W. Courson.
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1239–1242. 12 refs.

Forty-two naive subjects between the ages of 18 and 22 and free from eye defects viewed three Necker cubes in random order in a study of the effect of angle of retinal vision on the rate of fluctuation. Subjects fixated on a dot in the center of each cube which was situated left-face-forward-down for two-min. trials and counted the number of fluctuations. It was found that fluctuations decreased as the angle of retinal vision increased. The decrease in fluctuation rate between the 3° and 8° angles, although evident, was not significant. However, the decrease in fluctuation rate between the 8° and 13° angles was significant at the .01 level. The study suggests this phenomenon may be more subject to external control than realized and could also be a function of personality. More likely, the phenomenon is an interaction of some nomothetic cortical process and the individual's idiographic peculiarities. Fragmentation and distortion were reported by subjects on all three of the cubes. These phenomena support a learning interpretation.

A68-82046
MOTOR SKILLS BIBLIOGRAPHY: 93. PSYCHOLOGICAL ABSTRACTS, 1967, VOLUME 41, THIRD QUARTER.
R. B. Ammons and C. H. Ammons (Mont., U., Missoula).
Perceptual and Motor Skills, vol. 26, part 2, Jun. 1968, p. 1267–1270. 98 refs.

Ninety-eight references to research on motor skills are listed alphabetically.

A68-82047
WATER REQUIREMENTS IN HOT COUNTRIES.
J. P. Crowdy (Army Personnel Res. Estab., Farnborough, Great Britain).
Journal of the Royal Army Medical Corps, vol. 114, no. 3, 1968, p. 116–122. 24 refs.

In a series of four experiments to fix a scale of water allowances for troops in hot countries, the replacement of losses was taken as the criterion of requirement. This assumption is analyzed in the light of the levels of dehydration encountered and their effects on sweat and urinary outputs. Reasons are advanced for considering the "voluntary dehydration", observed only on the first active day of each experiment, to have had no appreciable effect on performance or sweat output. Very low urinary outputs were recorded in one experiment. The hypothesis is made that in conditions of high sweat outputs (in excess of 1/12 hr.) the skin provides an alternative route for the excretion of metabolic end-products.

A68-82048
APPROXIMATION OF FUNCTIONAL PERFORMANCE CRITERIA OF THE HUMAN OPERATOR: NOISE SUSCEPTIBILITY MODEL [APPROCHE DE LA FIABILITE DE L'OPERATEUR HUMAIN: MODELE DE VULNERABILITE].
M. Defayolle (Centre de Rech. du Serv. de Santé des Armées, Div. de Psychol., Lyons, France).
Ergonomics, vol. 11, Jul. 1968, p. 315–329. In French.

A hypothetical model is presented which explains the curvilinear relation between motivation and performance and individual differences in susceptibility to noise. The first section defines the idea of the complexity of a situation, distinquishing objective from subjective complexity. Repetition of experience corresponds to the elements summed on a matrix of variance, the variables being represented by the pairs of elements and their relationships. This subjective complexity includes a part related to a particular attitude induced by a task which the operator has undertaken and a remainder or noise which is not relevant. The operator's ability for processing information being limited, it is useful to filter the noise. On the efficiency of this filter and the ability to process information depends the complexity capable of being treated at one moment of time. The speed of solution of the problem depends on the number of simple operations necessary to treat the whole of the task complexity. The hypothesis is posed that there exists a correlation between complexity and motivation on the one hand and between motivation and the parameters of process information and filtering on the other hand. This relationship is thought to be exponential in form: increasing for that of processing information, decreasing for that of filtering. The determination of these parameters constitutes the subject of a programme of research in progress: the electrocardiographic characteristics, certain other measurements, cardiac frequency and so on which are involved in performance of tasks of known complexity.

A68-82049
MUSCULAR ACTIVITY PATTERN FOR SKILLED PERFORMANCE AND DURING LEARNING OF A HORIZONTAL BAR EXERCISE.
E. Kamon and J. Gormley (Loughborough U. of Technol., Dept. of Ergonomics and Cybernetics, Great Britain).
Ergonomics, vol. 11, Jul. 1968, p. 345–357. 9 refs.

A simultaneous recording of the electrical activity of some of the superficial muscles of the trunk, arm and thigh was made during the performance of the single knee circle mount on the horizontal bar. Changes in the pattern revealed by the recorded electromyograms (EMG) of two 12 yr. old schoolboys during a three mo. period while the exercise was learned were studied and compared with the pattern revealed by a trained gymnast. The EMG of a fluent performance by the gymnast showed co-ordinated activity between the hip-knee muscles and the arm-shoulder ones. At the early stages of practice the EMG of the schoolboys showed long duration of high bursts with much overlap between action of the different muscles. At the end of the training period the schoolboys performed the exercise fluently. Yet their EMG's showed that they did not reach the level of coordinated muscle activity shown by the trained gymnast. Histograms based on the recorded EMG clarified the changes in the pattern of the muscle activity with the improved performance due to training. The duration of the bursts of muscular activity became shorter, including reduction in the overlap of action. In the muscles of the hip, arms, and trunk-arm the timing of the peak activity became sequential indicating the improvement of co-ordination.

A68-82050
THE EFFECT OF A HORIZONTALLY STRUCTURED FIELD AND TARGET BRIGHTNESS ON VISUAL SEARCH AND DETECTION TIMES.
A. D. Lovie and P. Lovie (Liverpool, U., Dept. of Psychol., Great Britain).
Ergonomics, vol. 11, Jul. 1968, p. 359–367. 10 refs.

An experiment was performed in which detection times were compared for free and systematic search for a small visual target. Three different levels of target brightness were employed. The systematic search pattern consisted of a horizontal zig-zag between pairs of lines drawn on the visual field. The major findings were (1) that the systematic search and structured visual field only reduced the detection times of low contrast targets, and (2) that target contrast was an important variable independent of the condition of the visual field and the search instructions used. Subsequent analysis of the data revealed that the systematic search results could not be explained in terms of an increased uniformity of coverage of the visual field.

A68-82051
A COMPARISON OF THREE TYPES OF MANUAL CONTROLS ON A THIRD-ORDER TRACKING TASK.
P. N. Ziegler and R. Chernikoff (Naval Res. Lab., Washington, D.C.).
Ergonomics, vol. 11, Jul. 1968, p. 369–374. 7 refs.

Three types of control levers—the spring-centered-displacement control, the on–off control and the pressure control—were compared on a third-order compensatory tracking task. Based on an analysis of the control transfer functions, the predicted ranking of the three controls is: (1) pressure; (2) displacement; and (3) on–off. The results of a study in which five subjects tracked six trials with each control for 18 rankings of (1) pressure, (2) on–off and (3) displacement. However, the data taken during the latter sessions ranked the controls as predicted, although the difference between displacement and on–off was not statistically significant. Differences in results between early and late training, and comparisons of these results with other studies, are discussed.

A68-82052
AN IMPROVED DESIGN FOR A FORCE PLATFORM.
N. K. H. Hearn and S. Konz (Kan. State U., Dept. of Ind. Eng., Manhattan)
Ergonomics, vol. 11, Jul. 1968, p. 383–389. 12 refs.
(Intern. Ergonomics Congr., 3rd, Birmingham, Great Britain, Sep. 1967).

An advance in the state of art of force platform design is reported. Extension of the excellent work by Barany and Whetsel has given a platform with additional capability, greater sensitivity and better repeatability.

A68-82053
ACTIVITY FROM SKIN MECHANORECEPTORS RECORDED PERCUTANEOUSLY IN AWAKE HUMAN SUBJECTS.
A. B. Vallbo and K.-E. Hagbarth (Umea, U., Dept. of Physiol. and Acad., Hosp., Dept. of Clin. Neurophysiol., Uppsala, Sweden).
Experimental Neurology, vol. 21, Jul. 1968, p. 270–289. 21 refs
Swed. Med. Res. Council supported research.

A technique is described which allows recording of multi-fiber discharge and single-unit activity from intact peripheral nerves of awake human subjects. A tungsten electrode with a tip diameter of 5-15 μ. was driven manually through skin, subcutaneous tissues and nerve sheath. From many recording sites in mixed nerve trunks neural impulses with an amplitude of 40 μv. were recorded in response to peripheral mechanical stimuli. It was possible to judge

when afferent nerve fibers of cutaneous origin lay close to the electrode tip by the quality of the insertion paresthesias and the type of peripheral stimuli required to induce afferent responses. Examples are presented of fast and slowly adapting mass discharge induced by mechanical stimuli on glabrous and nonglabrous skin areas. When single-unit activity was discriminated it was often possible to determine the site of the cutaneous end organ, the discharge characteristics of the unit, and the conduction velocity of the nerve fiber. Ten such single-unit recordings are described.

A68-82054
RENAL FUNCTION IN WATER DEPRIVATION.
I. Forgacs, R. Chatel, and Maria Visy (U. Med. School, Inst. of Physiol., Budapest, Hungary).
Acta Physiologica Academiae Scientiarum Hungaricae, vol. 33, no. 3, 1968, p. 297–304. 15 refs.

The renal response to water deprivation with free food uptake has been studied in dogs over periods of 7 to 12 days. Urine osmolality reached its peak on the first or second day of fluid restriction. More sodium than water was retained by the kidneys. Towards the end of the experiments, plasma sodium level and hematocrit increased to extremely high values. Renal blood flow and glomerular filtration rate were significantly depressed. All the changes in renal function may be regarded as compensatory efforts to maintain extracellular fluid volume, and are not due to some impairment of the kidneys.

A68-82055
EFFECT OF COLD EXPOSURE ON OXYGEN TENSION IN BROWN ADIPOSE TISSUE IN THE NON-COLD-ADAPTED ADULT RAT.
Z. Szelenyi (U. Med. School, Inst. of Pathophysiol., Pecs, Hungary).
Acta Physiologica Academiae Scientiarum Hungaricae, vol. 33, no. 3, 1968, p. 311–316. 14 refs.

Adult rats adapted to room temperature were repeatedly exposed to an environmental temperature of 10°C. or 20°C. and 30°C. Temperature and oxygen tension (available oxygen) were measured in the interscapular brown adipose tissue with copper-constantan thermocouples in a gold oxygen electrode, respectively. In addition, colonic temperature and oxygen consumption were recorded. Cold exposure resulted in a fall of available oxygen in the brown fat, at the same time there was a rise in brown fat temperature and an increase in the animal's oxygen consumption. On the other hand, transfer of the rats from the cold into a thermoneutral environment induced a rise in brown fat available oxygen and a fill in brown fat temperature concurrently with the decrease in the animal's oxygen consumption. These results demonstrating the almost immediate increase in oxygen utilization of brown fat in response to cold, confirm the inferences drawn from local temperature changes in brown fat in response to changes in the thermal environment.

A68-82056
AN ADAPTIVE MECHANISM OF SYSTEMIC AND CEREBRAL CIRCULATION OF TRAINED SUBJECTS (DIVERS) IN VOLUNTARY APNEA [SU DI UN MECCANISMO DI ADATTAMENTO DELLA CIRCOLAZIONE SISTEMICA E CEREBRALE DURANTE L'APNEA VOLONTARIA IN SOGGETTI ALLENATI (SUBACQUEI)].
C. Vacca, A. La Tessa, and L. Vacca (Naples, U., Ist. di Fisiol. Umana 2 Cattedra, Ist. di Fisiol. Gen. e Spec. degli Animali Domestici e Chim. Biol., and Ist. Med.-Legale per L'A.M. "G. Gradenigo", Naples, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 31, Jan.–Mar. 1968, p. 3–33. 10 refs. In Italian.

Cerebral and systemic circulation was studied in 16 normal untrained subjects and four divers. Rheographic records were taken at the same time at the right upper limb and encephalon during repeated periods of voluntary apnea spaced out with rest periods lasting 10 min. Blood flow changes were calculated quantitatively by determining the surface of the triangle where a rheographic complex is inscribed. Electroencephalograms were recorded before and after apnea experiments both on normal subjects and divers. From all the data obtained and quantitatively studied, it was concluded that the divers, fit for long voluntary apnea, can separate the behavior of cerebral and systemic circulation, besides the other adaptive processes. In these subjects statistically significant changes of cerebral circulation were not observed, but some trend to vasodilation was observed, whereas in systemic circulation severe vasoconstriction was reported. On the contrary, in normal subjects, both cerebral and systemic circulation behave consistently, even if the per cent of change is not significant. Therefore the dissociate vasomotory mechanism of cerebral and systemic circulation, as well as the mild tachycardia allows divers to oxygenate the encephalon well during apnea in ambient air, thus extending the duration. The fundamental mechanism reported here of circulatory dissociation of the encephalon and other systemic districts in exactly like that of the harbor seal.

A68-82057
RED LIGHT FOR COCKPIT LIGHTING: RESULTS OF AN INQUIRY AND OF SOME EXPERIMENTS [LUCE ROSSA PER L'ILLUMINAZIONE DELLA CABINA DI PILOTAGGIO. RISULTATI DI UNA INCHIESTA E DI ALCUNE INDAGINI].
A. Scano and C. Terrana (Centro di Studi e Ric. di Med. Aeron. e Spaziale, Aeron. Mil. Ital., Rome, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 31, Jan.–Mar. 1968, p. 34–47. 10 refs. In Italian.

An inquiry was carried out on pilots and flight specialists of the Italian Air Force for the purpose of establishing, on the basis of individual experience, what lighting system for the cabin and instruments during night flight was preferred. Especially the pilots of fighter planes were in favor of indirect lighting with ultra-violet rays for instruments and phosphorescent needles and, in almost equally numbers, of red light (16.90% and 17.30% respectively). A larger number of preferences were recorded for a combination of the two systems (32%), while an overwhelming number were in favor of the combination of one of the two with the other or with white light of variable intensity (89%). The last type is considered necessary in case of storms to guard against dazzling from lightning and for brief consultation of navigation charts. The pilots of all classes (639) and specialists (240) questioned declared that they preferred combined systems in respectively 55.5% and 53.4% of the replies. Generally speaking, the inquiry confirmed the usefulness of a twofold type of lighting in the cockpit of airplanes. The questionnaires also show reasons for preferences, criticisms of individual systems, and the importance of the fact of being accustomed to a certain type of lighting. The experimental tests carried out on subjects of two age groups demonstrated that the influence of red light on the capacity of accomodation in different conditions of lighting is practically nil at around 20 yr. of age; while it is considerable at over 40, especially as regards the reading of very small characters.

A68-82058
MICROCLIMATE RECORDS OF WORK AMBIENTS IN CAVE [RILEVAZIONI MICROCLIMATICHE SU AMBIENTI DI LAVORO IN CAVERNA].
G. Rampazzo and G. Maniero (Padova, U., Ist. d'igiene, Italy).
Rivista di Medicina Aeronautica e Spaziale, vol. 31, Jan.–Mar. 1968, p. 48–55. 6 refs. In Italian.

A68-82059

Some microclimate records of work environments in a cave, carried out in a period of two yr., both in summer and winter were surveyed and discussed.

A68-82059
PSYCHOPATHOLOGIC SYNDROMES OF AIR FORCE FLIGHT INSTRUCTORS [SINDROMI PSICOPATOLOGICHE NEGLI ISTRUTTORI DI VOLO DELL'A.M.].

L. Longo.

Rivista di Medicina Aeronautica e Spaziale, vol. 31, Jan.–Mar. 1968, p. 56–87. 25 refs. In Italian.

After a short premise on the particular stress of flight duty as an instructor, the frequency of psychotic syndromes of flight instructors of Italian Air Force Schools in the period 1961 to 1966 was reported as well as diagnoses and medico-legal actions. Some general considerations were formulated on the relations between the psychotic syndromes and the particular operative and instructional activity of the different flight schools. Clinical and nosographic considerations on the psychopathological classification of these syndromes are also given. The low frequency of these syndromes, their responsible factors, as well the limiting and maintaining ones are indicated.

A68-82060
PATHOGENESIS OF WOLFF–PARKINSON–WHITE SYNDROME [SULLA PATOGENESI DELLA SINDROME DI WOLFF–PARKINSON–WHITE].

S. Castorina (Ist. Med.-Legale per L'A.M. "A. Mosso", Milan, Italy).

Rivista di Medicina Aeronautica e Spaziale, vol. 31, Jan.–Mar. 1968, p. 88–98. 15 refs. In Italian.

An unsuspected Wolff–Parkinson–White syndrome was found in a helicopter pilot with long normal flight activity and previous normal electrocardiographic and clinical records during the annual control examination. This syndrome was alternating and afterwards transitory. This variety of WPW syndrome, *per se* very rare, has a particular character is this case, due to the paradoxical effect of effort tests. Disappearance of normal conduction QRS complexes occurred instead of the anomalous conduction complexes, as was expected because of neurovegetative mechanisms, favoring the normal conduction of the stimulus and was activated by effort tests. In the light of this observation, the pathogenesis of WPW syndrome is studied by mentioning the more qualified theories and proposing a personal interpretation, at least on the case studied.

A68-82061
FURTHER CONTRIBUTION TO THE DETERMINATION OF CONTAMINANTS IN AVIATION LIQUID OXYGEN [ULTERIORE CONTRIBUTO ALLA DETERMINAZIONE DEGLI INQUINANTI NELL'OSSIGENO LIQUIDO AVIO].

E. Cianetti and G. Pecci.

Rivista di Medicina Aeronautica e Spaziale, vol. 31, Jan.–Mar. 1968, p. 99–103. In Italian.

The revised standard specifications for liquid oxygen used in aviation introduced in 1967 were presented. The new standards superseded the previous 1964 standards. The improvements made in the gas chromatography method permitted accurate detection of contaminants such as acetylene and ethylene.

A68-82062
SINE AND COSINE MASKING.

David M. Green (Calif., U., Dept. of Psychol., San Diego, La Jolla).

Journal of the Acoustical Society of America, vol. 44, Jul. 1968, p. 168–175. 10 refs.

PHS supported research.

Results of the masking of one sinusoid by brief pulses of another sinusoid are reported as a function of the phase of the masking pulse. In one case, the brief (10 msec.) masker is presented as a sine pulse; in the other case, the masker is presented as a cosine pulse. The sine pulse produces more masking than the cosine pulse at frequencies below the frequency of the masker and less masking at frequencies above the frequency of the masker. The inversion is explained on the basis of the power spectra of the two pulses. Details of the results are compared with a simple filter model and indicate that the ear's filter is at least a second-order system with a greater rate of attenuation above the center frequency of the filter than below.

A68-82063
BROWNIAN MOTION IN THE COCHLEAR PARTITION.

Gerard G. Harris (Bell Telephone Labs., Inc., Murray Hill, N. J.).

Journal of the Acoustical Society of America, vol. 44, Jul. 1968, p. 176–186. 23 refs.

Estimates have been made of the Brownian-pressure fluctuations in the air. These are 18 db, below threshold (minimum audible field) for 3,000 Hz. It is thus necessary to look into the ear itself to see whether thermal fluctuations limit the sensitivity of the ear. It is assumed that the first stage of amplification of acoustical energy takes place at the hair cell, and that it is the relative shear displacement between the top of the hair cell and the stereocilia that is the relevant parameter. Two estimates of Brownian fluctuation are made. The first estimate assumes a connection rigid enough to provide the greatest flow of acoustical energy to a hair cell–i.e., proper impedance match–and loose enough so that each hair cell has independent thermal displacements. The second assumes a rigid connection between the stereocilia and the tectorial membrane and thus the source of noise is the fluctuation in amplitude of the basilar membrane displacement. The impedances used in making these estimates were based on the *in vivo* measured impedances at the eardrum and the anatomy of the middle ear. The first estimate gives a signal-to-noise (S/N) ratio of 22 db. at threshold for 3,000 Hz. The second estimate gives an (S/N) ratio of −33 db. This calculation shows that it is necessary to assume that the stereocilia are attached to the tectorial membrane and that the hair-cell bodies are imbedded in the organ of Corti with some degree of rigidity. There is some direct experimental evidence for the assumption of rigid attachment, and there is much indirect evidence from ultrastructural studies. A critical evaluation is made of the assumptions and of the data used in the calculations.

A68-82064
MATHEMATICAL AND ELECTRICAL MODELS OF AUDITORY DETECTION.

Lloyd A. Jeffress (Tex., U., Dept. of Psychol. and Defense Res. Lab., Austin).

Journal of the Acoustical Society of America, vol. 44, Jul. 1968, p. 187–203. 27 refs.

NASA supported research.

McGill's generalization of Marill's formula for the probability of a correct response in a two-alternative, forced-choice experiment is obtained from a special case of the noncentral chi-square distribution. The present paper shows that a special case of the noncentral chi distribution is more appropriate than the noncentral chi square for monaural detection of a tonal signal in a continuous background of Gaussian noise. The special noncentral chi function fits distributions obtained from an electrical model, and yields psychometric functions appropriate both to it and to human observers. Estimates of bandwidth and of integration time derived from the distribution functions lie within the range of values often assumed from human subjects.

A68-82065
RECOGNITION PERFORMANCE AS A FUNCTION OF DETECTION CRITERION IN A SIMULTANEOUS DETECTION-RECOGNITION TASK.
William A. Lindner (Ind. U., Hearing and Commun. Lab., Bloomington).
Journal of the Acoustical Society of America, vol. 44, Jul. 1968, p. 204–211. 12 refs
AFOSR and NSF supported research.

On each trial, one of three stimulus events occurred: Presentation of (1) a 500-c.p.s. signal added to a sample of white noise; (2) an 1,100-c.p.s. signal added to the noise; or (3) no signal added to the noise. In the detection-recognition condition, each listener reported whether a signal occurred (detection) and which of the two signals it was (recognition). The listeners' criteria for a YES response were manipulated through instructions. The functions of primary concern were those relating the proportion of correct recognition responses to the proportion of YES responses on signal-pulse-noise trials, p(YES/S). The ability of listeners to detect the signals when they were not required to make the recognition response was measured in the detection condition. The proportion of correct recognition responses on trials on which the detection response was NO, p(C/NO), was above chance at all detection criteria. The data contradict the predictions made by a threshold model adapted to the detection-recognition situation. The proportion of correct recognition responses on all signal trials, whether the detection response was YES or NO, p(C), was unaffected by changes in criterion.

A68-82066
SOUND PRESSURE GENERATED IN AN EXTERNAL-EAR REPLICA AND REAL HUMAN EARS BY A NEARBY POINT SOURCE.
E. A. G. Shaw and R. Teranishi (Natl. Res. Council, Div. of Appl. Physics, Ottawa, Ontario, Canada).
Journal of the Acoustical Society of America, vol. 44, Jul. 1968, p. 240–249. 12 refs.
Acoust. Soc. of Am., 71st Meeting, Boston, Jun. 1, 1966.

A rubber replica has a pinna, concha, and auditory meatus with dimensions comparable with those of real human ears. At the eardrum position, there is provision for a totally reflecting termination (hard wall) or for various eardrum impedance networks. The replica is mounted in a rigid plane, and a point source at a distance of eight cm. provides sound with various angles of incidence over the frequency range 1–15 kHz. The sound pressure is measured with a probe-tube microphone at selected positions in the open canal and at the center of a plug closing the ear-canal entrance ("meatus-blocked" condition). The response with open canal and the response with blocked meatus have virtually identical angular dependence up to 12 kHz. From 2-7 kHz., there is substantial acoustic gain at the eardrum position associated with a fundamental canal resonance (M1) and a second mode largely controlled by a depth resonance of the concha (M2). Pressure distributions in the canal and concha are given for M1, M2, and three other modes. Limited data for six real ears with open and blocked canal are in good agreement with replica measurements up to seven kHz. At eight kHz., however, the on-axis response of real ears passes through a sharp minimum that is either removed to a higher frequency or is largely absent with the sound source above the axis.

A68-82067
MEASUREMENT OF PERSTIMULATORY LOUDNESS ADAPTATION.
Thomas E. Stokinger and Gerald A. Studebaker (Okla., U., Med. Center, Dept. of Commun. Disorders, Oklahoma City).
Journal of the Acoustical Society of America, vol. 44, Jul. 1968, p. 250–256. 13 refs.
PHS and Veterans Admin. supported research.

Experiments were conducted to investigate two of the variables encountered in the measurement of perstimulatory loudness adaptation. The first of these variables is the instruction to the observer for comparing the sensations in the test and control ears; i.e., equality based on equal loudness versus that based on a midline localization of the sound image. The second is the time of presentation of the comparison tone; i.e., simultaneous presentation with a portion of the adapting tone versus a delayed presentation mode in which the comparison tone occurs after the termination of the adapting tone. The results reveal: (1) that adaptation measured by localization balances exceeds that measured by loudness balances; and (2) that the simultaneous loudness-balance method shows more apparent adaptation than the delayed balance method. Hypotheses are presented in an attempt to explain these results.

A68-82068
EXTERNAL-EAR ACOUSTIC MODELS WITH SIMPLE GEOMETRY.
R. Teranishi and E. A. G. Shaw (Natl. Res. Council, Div. of Appl. Physics, Ottawa, Ontario, Canada).
Journal of the Acoustical Society of America, vol. 44, Jul. 1968, p. 257–263. 7 refs.

The properties of the human ear are duplicated in simple physical models that may be accurately specified. A shallow cylindrical cavity set in an infinite plane that represents the concha has a depth resonance with values of gain and bandwidth in agreement with those observed in typical real ears under "meatus-blocked" conditions. To represent the human pinna, a rectangular flange is added to an inclined cylindrical concha. A cylindrical canal with a two-element network to simulate the eardrum impedance completes the model. Response curves with hard and soft eardrums, measured at eardrum position, at canal entrance and with blocked meatus, all have identical angular dependence up to seven kHz. and very similar angular dependence up to at least 12 kHz. The response of the model with blocked meatus and with open canal is in good agreement with real-ear data up to seven kHz. at normal and oblique incidence. Pressure distributions in the model ear for the first two modes (M1 and M2) are in excellent agreement with replica data.

A68-82069
EXPLORATIONS IN AEROSPACE LAW.
Edited by Ivan A. Vlasic.
Montreal, McGill U. Press, 1968, xx+480 p. 83 refs.

This book is composed of 28 essays divided into six areas. These are: (1) aerospace law and power; (2) rights in airspace; (3) state sovereignity in airspace; (4) legal status of flight vehicles; (5) law of outer space; and (6) international regulation of aerospace activities. Besides the essays more recent articles are included. In these liability for damages by space vehicles is discussed as well as presentations given about the Manned Orbiting Laboratory and military defence in outer space. The author pleads for a single set of future rules to govern human flight at any altitude.

A68-82070
EXERCISE AT ALTITUDE.
Edited by R. Margaria (Milan, U., Ist. de Fisiol. Umana, Italy).
Amsterdam, Excerpta Medica Found., 1967, 216 p.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

This book is based on papers presented at an international symposium concerning physical exercise at altitude. The subject matter is rearranged according to the nature of the papers and includes: (1) aerobic and anaerobic energy sources in muscular exercise; (2) pulmonary ventilation during exercise at altitude; (3) the cost of the oxygen debt at high altitude; (4) blood lactate concentration during exercise at acute exposure to altitude; lactic acid production in submaximal muscular exercise; (5) lactacid O_2 debt in acute and chronic hypoxia; (6) theoretical effects of altitude on the equation of motion of a runner; (7) gas diffusion in the lung at altitude; (8) the factors affecting ventilation during exercise at sea level and at altitude; (9) readjustment of ventilation/perfusion relationships in the lung at altitude; (10) the adjustive responses of man at rest and work under low atmospheric pressure; (11) factors limiting the O_2 transporting capacity in exercise in hypoxia; (12) mixed venous blood gas tensions and cardiac output by "bloodless" methods—recent developments and appraisal; (13) changes in mixed venous oxygen tension at rest and exercise during exposure to altitude; (14) transport of O_2 and CO_2 at altitude; (15) oxygen capacity and affinity in mammals during high altitude acclimatization; (16) humoral control of erythropoiesis at altitude; (17) resistance of cardiac muscle to acute anoxia in high altitude adaptation; (18) training for maximum performance at altitude; (19) certain vascular adjustments and maladjustments at altitudes; and (20) exercise at altitude—historical remarks.

A68-82071
AEROBIC AND ANAEROBIC ENERGY SOURCES IN MUSCULAR EXERCISE.
Rodolfo Margaria (Milan, U., Ist. di Fisiol. Umana, Italy).
IN: Exercise At Altitude
Amsterdam, Excerpta Medica Found., 1967, p. 15–32. 15 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

Aerobic and anaerobic energy sources in muscular exercise are discussed. Included are the oxygen debt, alactacid oxygen debt, net and gross alactic oxygen debt and kinetics of the debt payment, and lactacid oxygen debt, a summary of exergonic processes in muscles, measurement of the maximal anaerobic power and measurement of the maximal aerobic power.

A68-82072
PULMONARY VENTILATION DURING EXERCISE AT ALTITUDE.
Robert F. Grover and John T. Reeves (Colo., U., Med. Center, Dept. of Med., High Altitude Res. Lab., Denver).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 33–39. 12 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.
Contract DA-49-193-MD-2551.

Data obtained from studies involving the analysis of the regulation of ventilation of sea level residents during exercise at various altitudes were examined. The concept of relative work load was proposed. This concept can be quantitated by expressing oxygen uptake (VO_2) as a percentage of maximum VO_2 (VO_2/VO_2 max). However, absolute heart rate is also a satisfactory index of relative work load under conditions when maximum heart rate is not depressed. There is a consistent relationship between ventilation and relative work load at all metabolic rates up to maximal exertion, at a wide range of altitudes, in individuals of both high and low working capacity and in populations native to high altitude as well as altitude-adapted man from sea level. Hence this concept has wide practical application as well as basic implications regarding respiratory regulation.

A68-82073
THE COST OF THE OXYGEN DEBT AT HIGH ALTITUDE.
J. Durand, Cl. Pannier, J. de Lattre, J. P. Martineaud, and J. M. Verpillat (Paris, U., Fac. de Med., Dept. de Physiol., France and Inst. Boliviano de Biol. de la Altura, La Paz, Bolivia).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 40–47. 13 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

The first steps of a study in which the total amount of oxygen used for a given amount of work measured as a function of altitude and acclimatization was reported. Subjects performed physical exercise at an altitude of 3,750 m. after a period of acclimatization lasting from 30 to 60 days. Measurements were made for oxygen consumption, carbon dioxide production, respiratory quotient, ventilation rate, respiratory rate and heart rate. It was concluded that at high altitude, at least in visitors, muscular work demands a greater amount of oxygen. This larger oxygen consumption does not appear during the exercise but occurs afterwards, during the recovery as a larger repayment of the oxygen debt.

A68-82074
BLOOD LACTATE CONCENTRATION DURING EXERCISE AT ACUTE EXPOSURE TO ALTITUDE.
Lars Hermansen and Bengt Saltin (GIH, Dept. of Physiol., Stockholm, Sweden).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 48–53.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.
Roy. Norweg. Min. of Educ. supported research.

The values for blood lactate concentrations and pH, as well as pulmonary ventilation and heart rate during submaximal and maximal exercise at different altitudes corresponding to 760, 580 and 462 mm. Hg, were related to absolute work performed and to the relative work load (oxygen uptake in per cent of maximal oxygen uptake at different altitudes). The same maximal lactate concentrations were achieved regardless of altitude, the blood lactate concentrations were higher during submaximal exercise with increasing altitude and values from different altitudes fell on the same line when related to relative work load. Blood pH and pulmonary ventilation exhibited similar patterns as that of the blood lactate concentration. These data were compared with blood lactate studies involving athletes and non-athletes.

A68-82075
LACTIC ACID PRODUCTION IN SUBMAXIMAL MUSCULAR EXERCISE.
H. Saiki, R. Margaria, and F. Cuttica (Milan, U., Ist. di Fisiol. Umana, Italy).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 54–57. 12 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

The lactic acid concentration in the blood of subjects performing a submaximal exercise was measured in the first few minutes of work, and the lactic acid production was calculated. One subject was an athlete, and the other was a non-athlete. Results indicated that no appreciable lactic acid production occurred at submaximal work loads once a steady state of oxygen consumption was reached. The hypothesis that the lactic acid formation is an exergonic emergency mechanism entering into play only when the oxidative system is insufficient to meet the demand was confirmed.

A68-82076
LACTACID OXYGEN DEBT IN ACUTE AND CHRONIC HYPOXIA.

Paolo Cerretelli (Milan, U., Ist. di Fisiol. Umana, Italy).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 58–64. 11 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

Experimental investigations dealing with the production of lactic acid during exercise at various altitudes were reviewed. Blood lactic acid concentrations were given for conditions of both acute and chronic hypoxia. Acute hypoxia did not influence significantly the anaerobic energy released by the tissues, and subjects chronically exposed to altitude seemed to have a reduced lactic acid production. It was concluded that all performances at altitude that involve a substantial lactacid O_2 debt should be impaired in athletes acclimatized to altitude. Events normally involving a maximal lactacid O_2 debt such as the 400 and 800 m. events will be adversely affected by the altitude of the next Olympic Games at Mexico City. By contrast, the 100 and 200 m. sprints or other brief performances which do not require the full lactacid capacity should not be influenced.

A68-82077
THEORETICAL EFFECTS OF ALTITUDE ON THE EQUATION OF MOTION OF A RUNNER.
B. B. Lloyd (Oxford, U., Lab. of Physiol., Great Britain).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 65–72. 17 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

The theoretical effects of altitude on the equation of motion of a runner were presented. Mathematical analyses of intrinsic energy and extrinsic energy were made with relation to energy metabolism, oxygen consumption and work capacity. Previous studies concerning athletic world records, energy, efficiency and exercise at altitude were reviewed. The effects of altitude were expressed by examining its effects on the equation which equates the energy supplied and energy consumed at any stage during a run involving a maintained maximal effort. Included was a table in which times predicted by an equation (covering the variations in extrinsic energy and air resistance expected at various altitudes) for Olympic Games distances at various altitudes were given.

A68-82078
GAS DIFFUSION IN THE LUNG AT ALTITUDE.
John B. West (Postgraduate Med. School, Clin. Respirat. Physiol. Res. Group, Great Britain).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 75–83. 7 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.
Med. Res. Council supported research.

Changes in the diffusing capacity of the lung for carbon monoxide were followed during the Himalayan Scientific and Mountaineering Expedition of 1960–61 in a group of normal subjects normally residing at sea level. Measurements were made at altitudes of 4,700 m. and 5,800 m. at work levels of 300 and 900 kg./min. using a bicycle ergometer. The diffusing capacity was calculated from the carbon monoxide concentration of inspired and mixed expired gas, the minute volume and the barometric pressure. Results indicated that the diffusing capacity does not increase during a short period of residence at high altitude. Measurements were also made of the alveolar oxygen tension, oxygen consumption and the minute volume during exercise. A fall in arterial oxygen saturation occurred simultaneously with a rise in alveolar oxygen tension, which strongly suggests a diffusion limitation to oxygen transfer. Cardiac output and ventilation were also found to be limiting factors in exercise at altitude.

A68-82079
THE FACTORS AFFECTING VENTILATION DURING EXERCISE AT SEA LEVEL AND AT ALTITUDE.
Giorgio Torelli and Edgardo d'Angelo (Milan, U., Labs. of Human Physiol. and Gen. Physiol., Italy).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 84–107. 100 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

The effect of each factor among those controlling ventilation were treated individually both for normoxia and hypoxia. Humural control of ventilation was discussed. Included were the CO_2 response at a steady state, [H+] response a steady state, transient response to CO_2 and [H+] and steady-state response to hypoxia. Neurogenic control of ventilation during exercise was discussed, and ventilation during the first seconds of exercise and recovery was given. Also presented were discussions of the regulation of ventilation in exercise at sea level and pulmonary ventilation during exercise in acclimatized subjects.

A68-82080
READJUSTMENTS OF VENTILATION/PERFUSION RELATIONSHIPS IN THE LUNG AT ALTITUDE.
P. E. Haab, D. R. Held, and L. E. Farhi (Fribourg, U., Inst. de Physiol., Switzerland and N. Y., State U., Dept. of Physiol., Buffalo).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 108–111. 8 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.
Swiss Natl. Res. Fund and NSF supported research.

Four healthy young subjects were studied during a five day expedition of the Jungfraujoch Alpine Research Station at an altitude of 3,450 m. and at an altitude of 630 m. Their $aADN_2$, $aADCO_2$, end-expiratory PCO_2 and PaN_2 were determined. Results indicated that adaptive mechanisms were operative from the first days of residence at altitude.

A68-82081
THE ADJUSTIVE RESPONSES OF MAN AT REST AND WORK UNDER LOW ATMOSPHERIC PRESSURE.
Wlodzimierz Missiuro (Polish Acad. of Sci., Inst. of Work Physiol., Warsaw, Poland).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 112–123. 30 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

The adjustive responses of man at rest and work under low atmospheric pressure were presented by reviewing studies concerned with the physiological changes occurring at different altitude levels. Topics which were discussed included: (1) the symptoms of hypoxia; (2) mechanisms of the action of hypoxia; and (3) physical work at altitude.

A68-82082
FACTORS LIMITING THE OXYGEN TRANSPORTING CAPACITY IN EXERCISE IN HYPOXIA.
Johannes Piiper (Max Planck Inst. for Exptl. Med., Dept. of Physiol., Gottingen, West Germany).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 127–136. 25 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

Analyses of factors limiting O_2 transporting capacity during exercise in hypoxia were presented based on the results of an experimental study of dogs running on a treadmill. All available evidence pointed to the cardiac output as the principal limiting factor for O_2 supply. It was emphasized that the distributional and diffusional factors of O_2 supply limitation must be simultaneously effective in the body.

A68-82083
MIXED VENOUS BLOOD GAS TENSIONS AND CARDIAC OUTPUT BY "BLOODLESS" METHODS–RECENT DEVELOPMENTS AND APPRAISAL.
L. E. Farhi and P. Haab (N. Y., State U., Dept. of Physiol., Buffalo and Fribourg, U., Inst. de Physiol., Switzerland).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 137–144. 15 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.
Swiss Natl. Res. Fund and NSF supported research.

Two recent methods for obtaining mixed venous blood gas tensions are reviewed. In the first method, venous carbon dioxide tension (P_{VCO2}) is obtained from analysis of the change in alveolar gas composition during a single expiration. In the second method, both venous oxygen tension and P_{VCO2} are obtained by rebreathing. Both techniques are well suited to study during exercise. When the venous tension values thus obtained are used to calculate pulmonary blood flow (cardiac output in the normal man during steady state), it is necessary to know the alveolar gas tensions, the alveolar-arterial tension differences and the blood dissociation curves for the subject under study. The sources of error in this procedure are reviewed.

A68-82084
CHANGES IN MIXED VENOUS OXYGEN TENSION AT REST AND EXERCISE DURING EXPOSURE TO ALTITUDE.
P. Haab, A. Chinet, and L. E. Farhi (Fribourg, U., Inst. de Physiol., Switzerland and N. Y., State U., Dept. of Physiol., Buffalo).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 145–146.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.
Swiss Natl. Res. Fund and NSF supported research.

Changes in mixed venous oxygen tension at rest and exercise during exposure to altitude were studied in five healthy young males at altitudes of 630 m. and 3,450 m. The possibility that a physiological limitation in O_2 transfer may be present was indicated.

A68-82085
TRANSPORT OF OXYGEN AND CARBON DIOXIDE AT ALTITUDE.
F. Kreuzer (Nijmegen, U., Dept. of Physiol., The Netherlands).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 149–158. 19 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

The transport of O_2 and CO_2 at altitude was discussed by a review of the literature in relation to basic concepts applicable to sea level physiology. The adaptations of the transport system to hypoxia includes maintaining an adequate mixed venous O_2 pressure, balancing the acid-base conditions and CO_2 effects. The CO_2 effect is thought to contribute to increasing the steepness of the physiological dissociation curve between arterial and venous print in hypoxia and after altitude acclimatization. This would aid keeping an adequate mixed venous of O_2 pressure.

A68-82086
OXYGEN CAPACITY AND AFFINITY IN MAMMALS DURING HIGH ALTITUDE ACCLIMATIZATION.
H. Bartels (Physiol. Inst., Med. Hochschule, Hannover, West Germany).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 159–162. 6 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

The oxygen capacity increases of different mammals with different oxygen affinities as well as possible changes of oxygen affinity during high altitude acclimatization were compared. The results of several investigations were utilized.

A68-82087
HUMORAL CONTROL OF ERYTHROPOIESIS AT ALTITUDE.
Cesar Reynafarje (San Marcos, U., Fac. de Med., Inst. de Biol. Andina, Lima, Peru).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 165–170. 9 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

Several investigations concerned with the humoral control of erythropoiesis were reviewed. The results of a study involving the erythropoietic stimulating factor during exposure to acute and chronic hypoxia were in agreement with the concept that erythropoietin is a hormone which is consumed by the erythropoietic tissue and that it increases in the circulating blood for a few hours when there is a great production of this hormone due to a sudden demand for red cell formation. Experiments on the inhibitory effect of plasma from altitude natives brought to sea indicated that an inhibitory humoral factor exists in the plasma of high altitude natives brought down to sea level, as one of the regulatory mechanisms of erythropoietic activity. Studies of the erythropoietin in high altitude adapted animals (llamas and alpacas) did not show an increase in erythropoietin when these animals were observed under normal conditions, indicating an equilibrium between their processes of red cell formation and destruction.

A68-82088
RESISTANCE OF CARDIAC MUSCLE TO ACUTE ANOXIA IN HIGH ALTITUDE ADAPTATION.
O. Poupa (Czech. Acad. of Sci., Inst. of Physiol., Prague).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 171–178. 14 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

A review is presented of the results concerning adaptation of cardiac muscle to oxygen lack and some of the consequences of such adaptation in experimental cardiac pathology. The contractibility of the isolated right ventricle of the heart of the rat is reduced by anoxia *in vitro.* The degree of recovery of contractility after re-introduction of oxygen under constant conditions (duration of N anoxia, frequency of stimulation, temperature) may serve as a measure of the resistance of cardiac tissue to anoxia. Acclimation of animals (rats) to a simulated altitude (5,000 to 7,000 m.) increases the resistance of the isolated right cardiac ventricle to acute anoxia *in vitro.* This is considered as a proof for the "cellular level" of altitude acclimation. The increased concentration of myoglobin in the isolated heart from acclimatized rats was not correlated with increased resistance to anoxia of cardiac tissue isolated from these rats. Adrenalectomy results in a decrease in the blood concentration of haemoglobin, the cardiac concentration myoglobin and the resistance of the isolated right ventricle to anoxia. The increased resistance of the right cardiac ventricle to acute anoxia *in vitro* is not conditioned by the presence of the adrenal glands during acclimation. The results are discussed with regard to the mechanisms responsible and to the finding that the hearts from animals adapted to altitude are more resistant to necrogenic stimuli (isoproterenol).

A68-82089
TRAINING FOR MAXIMUM PERFORMANCE AT ALTITUDE.
B. Balke, J. T. Daniels (Wis., U., Madison), and J. A. Faulkner (Mich., U., Ann Arbor).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 179–186. 14 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

The problem of training athletes for maximum performance at altitude was discussed. For optimum success of training at altitude, the factors of duration and intensity of training appear to

be as important as the best level of altitude at which the training takes place. Several experiments concerned with this problem were reviewed. The implications in regard to altitude training are clear: speed work has to be emphasized during altitude training to maintain or to increase muscle power. In order to cope with the nearly intolerable organic functional demands during modern training schedules, the intervals of near-maximum energy output have to be shorter that at sea level, and the recovery periods slightly longer. Progressing altitude acclimatization might eventually restore former sea level training routines. Another feasible approach appears to be the intermittent training at moderate, high and low elevations to combine the physiological benefits necessary for all-out competition over longer distances.

A68-82090
CERTAIN VASCULAR ADJUSTMENTS AND MALADJUSTMENTS AT ALTITUDES.
Hans H. Hecht (Chicago, U., Dept. of Med., Ill.).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 189–200. 31 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.
Grant PHS HE-5673 and Chicago Heart Assn. supported research.

The following were discussed: (1) transient respiratory maladjustments with the occurrence of Cheyne–Stokes (phasic) respiration in the unacclimatized at moderate to high altitudes; (2) the polycythemic response and alveolar hyponentitation at altitude and its relation to chronic mountain sickness in man; (3) pulmonary hypertension and pulmonary hypertensive heart disease; and (4) the perplexing problem of pulmonary edema occurring at high altitudes. The important contribution of altitude physiology toward many problems related to clinical medicine in general was illustrated. Certain insights into the mechanisms of acclimatization to great heights were also provided.

A68-82091
EXERCISE AT ALTITUDE–HISTORICAL REMARKS.
Ernst Jokl (Ky., U., Lexington).
IN: Exercise At Altitude.
Amsterdam, Excerpta Medica Found., 1967, p. 203–205. 15 refs.
Intern. Symp., Milan, Sep. 29–Oct. 2, 1966.

The history of investigations concerned with exercise and oxygen consumption at altitude was discussed briefly.

A68-82092
INTEROCEPTORS.
V. N. Chernigovskiy.
Washington, D. C., Am. Psychol. Assn., 1967, xxxv+804 p. Many refs.
Grant PHS NB-02743.

A description of reflexes of various interoceptors (chemoreceptors, mechanoreceptors, etc.) is given. Methods of stimulation, the formation of excitation and inhibition of the central regions in the reflex arcs are examined. The importance of relation interoceptive signalization and its relation to pathogenesis of various bodily states is stressed. A general discussion is given of the biological importance of interoception and its role in motor activity, nourishment and homeostasis. A bibliography of more than 2,000 sources is listed.

A68-82093
RESPIRATORY TOLERANCE CURVES FOR CARBON DIOXIDE DURING REBREATHING. 1. THE METHOD OF THE QUANTITATIVE DETERMINATION OF THE RESPIRATORY SENSIBILITY ON CARBON DIOXIDE [RESPIRACNE TOLERANCNE KRIVKY NA KYSLICNIK UHLICITY PRI SPATNOM DYCHANI. 1. METODIKA KVANTITATIVNEHO URCENIA RESPIRACNEJ CITIVOSTI NA KYSLIENIK UHLICITY].
E. Pevny and N. Scheida.
Casopis Lekaru Ceskych, vol. 107, Jan. 19, 1968, p. 81–85. 28 refs. In Czech.

The method of the exact determination of the initial hyperventilation interval depending on P_{CO_2} was elaborated. Together, the rebreathing method was used. To eliminate the hypoxia effect, 11 men without diseases of cardiopulmonary system were studied in the initial oxygen atmosphere with the volume of four l. The determination of terminal partial pressures of O_2 and CO_2 was confirmed. The increase of ventilation on the one hand by means of the index of the respiratory sensibility for CO_2 and on the other by means of the angle tangents determining the ventilation increase was evaluated. The frequency was almost unchanged.

A68-82094
INFLUENCE OF CHLOROTHIAZIDE ON RENAL EXCRETION OF CALCIUM [VLIV CHLOROTHIAZIDU NA RENALNI VYLUCOVANI VAPNIKU].
O. Schuck and I. Sotornik.
Casopis Lekaru Ceskych, vol. 107, Jan. 5, 1968, p. 11–14. 10 refs. In Czech.

Chlorothiazide reduces significantly calcium excretion. The decrease in calcium excretion is most pronounced at the moment when renal excretion of sodium returns to lower values after a transient increase. Renal excretion of calcium in the course of chlorothiazide administration shows no dependence on renal excretion of potassium. It is probable that chlorothiazide acts upon the transport of calcium in the distal part of the nephron and that this effect depends on simultaneous changes in tubular transport of sodium.

A68-82095
IMPORTANCE OF THE PENTOSE CYCLE IN RADIOBIOLOGY [VYZNAM PENTOZOVEHO CYKLU V RADIOBIOLOGII].
J. Sonka, J. Hilgertova, Z. Dienstbier, and J. Pospisil.
Casopis Lekaru Ceskych, vol. 107, Jan. 5, 1968, p. 18–20. In Czech.

Radioactive irradiation brings about an inhabition of the pentose cycle lasting several days. The finding of the suppression of this cycle together with some other biochemical deviations contribute not only to the elucidation of the origin of some basic manifestations of radiation disease, but may also serve as base for the search for new radioprotective drugs and new therapeutic processes.

A68-82096
RADIATION-HYGIENIC MEASURES DURING LIQUIDATION OF AN AIRCRAFT CRASH CONNECTED WITH RADIOACTIVE CONTAMINATION [RADIACNE HYGIENICKE OPATRENIA PRI LIKVIDACIILETECKEJ HAVARIE SPOJENEJ S RADIOAKTIVNOU KONTAMINACIOU].
Stefan Csupka, Jozef Carach, Maria Petrasova, Tomas Trnovec, and Frantisek Minarik.
Pracovni Lekarstvi, vol. 19, Dec. 1967, p. 445–449. In Czech.

An aircraft crash where all passengers were killed (82 persons) took place near Bratislava on November 24, 1966. A consignment containing ^{131}I of total activity 2,250 Ci was on board. The aircraft was damaged by the collision and fire as well as the containers that were split open contaminating the environs by the

radioactive material. The external radiation in the contaminated area ranged between 50 μR./h. and 200 μR./h. The surface radiation was measured on all the killed persons and found in 51 cases less than 0.15 μCi, in 27 ones with the range 0.15 and 1 μCi and in the last four cases above 1 μCi ^{131}I on the effective area of the detector, that is 150 cm^2. The permission to take the debris away was given only after the radiation ^{131}I decreased (after ten halftimes). The victims, whose surface contamination ^{131}I did not exceed 1 μCi were considered as less contaminated so that the post-mortem examination was permitted without any special measures. Four corpses whose surface contamination exceeded 1 μCi were decontaminated at the place of the crash by lukewarm water.

A68-82097

INFLUENCE OF HYPERVENTILATION ON THE CHRONAXIE OF THE MOTOR CORTICAL AREA OF THE LARGE CEREBRAL HEMISPHERES [VLIIANIE GIPERVENTILIATSII NA KHRONAKSIIU MOTORNOI ZONY KORY BOL'SHIKH POLUSHARII GOLOVNOGO MOZGA].

V. S. Raevskii and T. N. Kovaleva (USSR. Acad. of Med. Sci., Moscow).

Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 65, Jan. 1968, p. 23–26. 10 refs. In Russian.

The authors studied the influence of hyperventilation on chronaxie of the motor cortical area of the large cerebral hemispheres in acute experiments on dogs under morphine-urethane anesthesia. Experiments were carried out both with open and closed thorax. In all experiments with hyperventilation chronaxie of the motor cortical area of the large hemispheres increased as compared to the initial level, recorded with normoventilation of the lungs. At the end of hyperventilation and after return to normoventilation chronaxie reverted to normal. Increase of chronaxie with hyperventilation is due to hypocapnia and removal of afferentation of the nerve impulses into the cortex from the respiratory center and respiratory muscles when the respiratory center enters the period of apnea. Increase of chronaxie of the cortical motor area following hyperventilation as seen with constant or slightly altered (from 0.5 to 1.0°C.) temperature of the brain and is not related to variations of the arterial blood pressure.

A68-82098

EFFECT OF GAMMA-AMINOBUTYRIC ACID AND ITS DERIVATIVES ON THE RESISTANCE OF ANIMALS TO HYPOXIA [VLIIANIE GAMMA-AMINOMASLIANOI KISLOTY I EE PROIZVODNYKH NA USTOICHIVOST' ZHIVOTNYKH K GIPOKSII].

S. V. Osipova, N. V. Uskova, and R. A. Khaunina (V. M. Bekhterev Leningrad Sci.-Res. Psychoneurol. Inst., Lab. of Psychopharmacol. and Leningrad Pediat. Med. Inst., Dept of Pharmacol., USSR).

Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 65, Jan. 1968, p. 72–76. 17 refs. In Russian.

Two derivatives of gamma-aminobutyric acid (GABA), gamma-hydroxybutyric acid (gamma-hydroxybutyrate) and beta-phenyl-gamma-aminobutyric acid (BPGABA), showed an ability upon intraperitoneal administration to increase the resistance of animals (mice and rats) to hypoxia caused by reduction of the atmospheric pressure. In experiments on mice the duration of the protective effect of BPGABA surpasses gamma-hydroxybutyrate; however, the most effective doses of gamma-hydroxybutyric acid (in respect to LD50) are five times less than BPGABA. There was found a coincidence of increased resistance of mice to hypoxia with other effects of gamma-hydroxybutyrate and BPGABA, such as restricted movement and hypothermia.

A68-82099

INFLUENCE OF THE PREPARATION OF MUMIE ON THE LYMPHOPOIESIS IN ACUTE RADIATION SICKNESS [VLIIANIE PREPARATA MUMIE NA LIMFOPOEZ PRI OSTROI LUCHEVOI BOLEZNI].

V. D. Rogozkin and T. Tukhtaev.

Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 65, Jan. 1968, p. 110–111. In Russian.

The administration of the preparation mumie in a dose of 500 mg./kg. from the first to the 20th day after irradiation (SD_{65}) stimulates lymphopoiesis in acute radiation sickness. This is manifested by a more rapid restoration of the number of lymphocytes in the peripheral blood, bone marrow and spleen of animals treated. The preparation mumie produces some stimulating influences on the erythropoiesis, mostly, in the restorative stage of acute radiation sickness.

A68-82100

DISCREPANCY BETWEEN DATA OF DIRECT AND INDIRECT CALORIMETRY IN HYPOXIA [O RASKHOZHDENII MEZHDU DANNYMI PRIAMOI I NEPRIAMOI KALORIMETRII PRI GIPOKSII].

L. K. Cherednichenko and K. P. Ivanov (USSR, Acad. of Sci., I. P. Pavlov Inst. of Physiol., Lab. of Ecol. Physiol. and Lab. of Thermoregulation, Leningrad).

Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 65, Feb. 1968, p. 11–14. 15 refs. In Russian.

Under study was the discrepancy between data of direct and indirect calorimetry during a diminished content of oxygen in the inhaled air. In albino rats discrepancies are seen between the values of actual thermoproduction (according to data of direct calorimetry) and thermoproduction assessed by means of gas exchange. The authors discuss the possible mechanisms of this discrepancy. These differences disappear during breathing with atmospheric air.

A68-82101

OXYGEN TENSION IN THE SKELETAL MUSCLE IN NONMEDICINAL HYPOTHERMIA [NAPRIAZHENIE KISLORODA V SKELETNOI MYSHTSE PRI GIPOTERMII U NENARKOTIZIROVANNYKH KRYS].

V. A. Bernshtein and V. A. Berezovskii (A. A. Bogomol'ts Inst. of Physiol., Kiev and Kazakh Inst. of Oncol. and Radiol., Alma-Ata, UkrSSR).

Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 65, Feb. 1968, p. 36–38. 13 refs. In Russian.

By means of the amperometric technique the authors investigated the oxygen tension in the musculus gastrocnemious of non-narcotized albino rats in hypothermia. Reduction of the body temperature is accompanied by a consequent drop of pO_2; in cooling down to 34° it averages 65% of the initial level, in the 34–30° range it is 40%. In the process of artificial warming there is noted a restoration of pO_2. The data derived testify of the fact that cold thermogenesis is effected in conditions of muscular hypoxia.

A68-82102

STUDY OF THE EFFECT OF ANTIBODIES IN THE INTESTINAL TRACT OF GERM-FREE BABY PIGS.

J. Rejnek, J. Trávníček, J. Kostka, J. Sterzl, and A. Lanc (Czech. Acad. of Sci., Inst. of Microbiol., Dept. of Immunol., Prague).

Academia Scientiarum Bohemoslovaca, vol. 13, no. 1, 1968, p. 36–42. 31 refs.

The effect of antibodies in the intestinal tract was studied in germ-free baby pigs whose intestinal barrier was closed to

macromolecules by the peroral administration of modified cow's milk for the first 72 hr. after birth. They were then all contaminated with the pathogenic strain *Escherichia coli* 055 in amounts of 10^9 bacterial cells per animal. The controls, which were not given any antibodies, all died within 24 hr. All the experimental animals given 12.5–50 ml. immune colostrum or serum survived, while those given 50 ml. normal serum or colostrum containing natural antibodies reacting with the *Escherichia coli* test strain, 50% survived. No circulating antibodies were found in the serum of the experimental animals after the administration of serum or colostrum. The antibodies present in colostrum thus appear to protect the newborn organism directly in the intestinal tract, which is the first site of bacterial invasion, as well as after infiltration into the blood stream.

A68-82103
THE HIGH ALTITUDE RESIDENT OF NORTH AMERICA.
R. F. Grover (Colo., U., Med. Center, Denver).
Scientia, vol. 103, no. 669–670, 1968, p. 9–25. 42 refs.

Because the Leadville residents have been at high altitude for only a few generations, the incidence of adverse reactions to hypoxia is relatively high (hypoventilation, polycythemia, severe pulmonary hypertension, pulmonary edema). Insufficient time has elapsed for natural selection to remove from the population those persons who do not adapt well. This is in contrast to the Andean populations where those persons unable to adapt have been eliminated. The result there is a highly select population which probably displays much less individual variability than is seen at sea level. Therefore, in studying the Leadville population, one may expect to find some individuals who have adapted to high altitude fully as well as the average Andean native, but one will also find many persons who are not so well adapted.

A68-82104
THE PULMONARY TOXICITY OF OXYGEN.
Alfred P. Morgan (Harvard Med. School and Peter Bent Brigham Hosp., Boston, Mass.).
Anesthesiology, vol. 29, May–Jun. 1968, p. 570–579. 45 refs.
AEC, U.S. Army, NIH, and Hartford Fund supported research.

It is possible that the direct pulmonary toxicity of oxygen contributes significantly to the mortality of the critically ill, the patients in whom its use is most necessary. There are basic questions about oxygen toxicity, in particular the mechanism through which it occurs, that are unanswered, largely because of the very fundamental character of the biologic problem. Nevertheless, some provisional conclusions are possible. One is that no toxic threshold exists. Any increase in the oxygen percentage of the inspired gas mixture is a threat, but when oxygen administration is limited to a few days, percentages over 70% are dangerously high. Opportunities for unintended use of high concentrations have become more frequent with commoner use of mechanical ventilatory assistance. Still, hypoxemia has to be treated with oxygen in the concentration necessary to maintain acceptable arterial P_{O_2}; what this must be is a matter of individual clinical judgment, but surely it seldom would be much above 100 mm. Hg. It can be expected that contributory factors, in themselves susceptible to treatment, will be identified in the future. The ultimate answer to the problem probably lies in the area of biochemical protection.

A68-82105
CRITERIA FOR PHYSIOLOGICAL STRESS PRODUCED BY INCREASED CHRONIC ACCELERATION.
R. R. Burton and A. H. Smith (Calif., U., Dept. of Animal Physiol., Davis).
Proceedings of the Society for Experimental Biology and Medicine, vol. 128, Jun. 1968, p. 608–611. 23 refs.
NASA Grant NGR-05-004-008.

Chickens were exposed continuously for several months to increasing accelerations up to three g in a centrifuge. Exercise capacity, hematocrit and lymphocyte counts were determined. After one wk. exposure to three g, exercise capacity was lowered, lymphocyte counts decreased, but hematocrits remained normal. Birds that died after three mo. at three g had significantly lower lymphocyte counts than survivors. It was possible to identify at 70% accuracy the animals that would survive more than three mo. at three g after a week of exposure. Adaptation to increased acceleration was accompanied by increased hematocrit and no change in exercise capacity, but during the stress period these parameters were impaired.

A68-82106
VISUAL FATIGUE AND ADAPTATION TO DARKNESS [ZRAKOVÁ UNAVA A ADAPTACIA NA TMU].
H. Florek.
Ceskoslovenska Psychologie, vol. 12, no. 3, 1968, p. 217–231. 31 refs. In Czech.

The study was part of a wider research project of visual fatigue in workers, 20 subjects, from a stereoplanographic department [photogrametry] and 20 workers from the department of quality control and supercontrol in the production of TV sets, [experimental groups]. Adaptation to darkness, interrupted visual stimulation, visual acuity, binocular visual field, depth perception, perception of geometrical-optical illusions, simple reaction time and color vision were studied. For the sake of comparison 27 subjects were examined for optimum visual conditions [controls]. To measure the adaptation processes to darkness at the beginning and end of the working shift, Hartinger's ocular recording adaptometer was used. The study showed that individuals with a higher absolute sensitivity were found in the experimental groups rather than among the controls. The average times of comparative sensitivity levels between the controls and the experimental groups differed significantly at the beginning of the working shift, and became rather accidental at the end of the shift. Time differences of each group between the beginning and end of shifts proved to be without significance. It was found that adaptation to darkness had the same start in all the groups, a common initial course and a very similar further progress. Increase in sensitivity was accompanied by gradually growing differences between the groups under study: they were nevertheless, rarely of significance and lost their character of randomness in the vicinity of lower thresholds.

A68-82107
ADVERSE EFFECT OF OXYGEN ON TRACHEAL MUCUS FLOW.
Gustave A. Laurenzi, Sam Yin, and Joseph J. Guarneri (N. J. Coll. of Med. and Dentistry, Dept. of Med., Div. of Respirat. Diseases, Jersey City).
New England Journal of Medicine, vol. 279, Aug. 15, 1968, p. 333–339. 23 refs.
Grant PHS AP-00005-06 and Council for Tobacco Res.-U.S.A. supported research.

The effect of oxygen on tracheal mucus flow was measured in young cats by a particle-transport technique. Any deviation from ambient oxygen tension in the inspired air, high or low, had an adverse effect on mucus flow; 100% oxygen produced marked impairment. Basal mucus flow was improved, and the adverse oxygen effects were prevented and reversed by epinephrine compounds and adenosine triphosphate. These results, which are interpreted in terms of inhibition of carbohydrate metabolism by oxygen and the positive effect of catecholamines on this function, suggest a subtle, but potentially dangerous, form of oxygen toxicity.

A68-82108
CALCITONIN (THYROCALCITONIN).
Giraud V. Foster (Roy. Postgraduate Med. School, Wellcome Unit. of Endocrinol. and Hammersmith Hosp., London, Great Britain).
New England Journal of Medicine, vol. 279, Aug. 15, 1968, p. 349–360. 112 refs.
AHA supported research.

A comprehensive review is presented of the history and uses of thyrocalcitonin (calcitonin). The review includes discussions of the hormone's discovery, physical properties, cellular origin, purification, and synthesis. A detailed account of action and physiology of the hormone is presented, and a number of animal studies are reviewed in light of species differences. Therapeutic uses are pointed out and the suggestions are made as to the possible physiological significance of the hormone. A bibliography with 112 references is included.

A68-82109
AVIATION PATHOLOGY
British Medical Journal, vol. 3, Jul. 27, 1968, p. 201. 8 refs.

The importance of pathology and more specifically, the role of the pathologist to aviation medicine is discussed in relation to aircraft accident investigations. The most important role of the pathologist is determining the cause of an aircraft accident. These causes may be anything from anoxia to sabotage, and the pathologist may be the only person capable of giving prima facie evidence. A need for a central investigative unit for the United Kingdom is cited.

A68-82110
HEARTS, HEIGHTS, AND HYPOXIA.
Sciences, vol. 8, Aug. 1968, p. 25–27.

The effects of altitude on blood circulation and pulmonary functions were briefly discussed. Several current studies concerned with blood flow and hypoxia at altitude were reviewed summarily.

A68-82111
EFFECTS OF HYPERBARIC OXYGEN, THE HYPERBARIC STATE, AND RAPID DECOMPRESSION ON PULMONARY SURFACTANT.
Charles K. McSherry, Alexander Panossian, Vincent J. Jaeger, and Frank J. Veith (Cornell U., Med. Coll., Depts. of Surg.; Albert Einstein Coll. of Med.; and Montefiore Hosp. and Med. Center, Div. of Surg., New York, N. Y.).
Journal of Surgical Research, vol. 8, Jul. 1968, p. 334–340. 24 refs.
Assn. for Acad. Surg., First Ann. Meeting, Lexington, Ky., Nov. 10–11, 1967.
Grant PHS HE 11472; Edward H. Little Fund; New York City, Health Res. Council; and John and Mary R. Markle Found. supported research.

Single acute and intermittent chronic exposure of rabbits to hyperbaric oxygen produced a significant reduction of pulmonary surfactant. The minimal surface tension of lung extracts of animals exposed to increased environmental pressure without elevation of the partial pressure of alveolar oxygen was normal. The rapid decompression of rabbits from three ATA to one ATA also produced a significant reduction of pulmonary surfactant. Atelectasis, hemorrhage, alveolar thickening, and exudates were frequently noted in the lungs of rabbits exposed to hyperbaric oxygen. These morphological changes did not consistently correlate with the measured increases in minimal surface tension of lung extracts.

A68-82112
METABOLIC ASPECTS OF CALORIE RESTRICTION: HYPOHYDRATION EFFECTS ON BODY WEIGHT AND BLOOD PARAMETERS.
C. Frank Consolazio, LeRoy O. Matoush, Herman L. Johnson, Harry J. Krzywicki, Gerhard J. Isaac, and Norman F. Witt (Fitzsimons Gen. Hosp., U.S. Army Med. Res. and Nutr. Lab., Denver, Colo.).
American Journal of Clinical Nutrition, vol. 21, Aug. 1968, p. 793–802. 22 refs.

In this study a group of eight men consumed 420 kcal./day for ten days with a daily energy expenditure of 3,200 kcal./day. It was observed that limited calories without mineral supplementation appeared to be more beneficial than complete starvation. Some major abnormalities were still present including fairly large body water losses during days one and two, significant protein losses, and abnormal electroencephalogram (EEG) patterns in all men in group I during calorie restriction. The EEG's from all of these men were normal within two days on return to a normal dietary intake. Mineral supplementation with limited carbohydrate calories had beneficial effects in reducing water deficits and hypohydration, preventing ketosis, and preventing abnormal EEG tracings.

A68-82113
METABOLIC ASPECTS OF CALORIE RESTRICTION: NITROGEN AND MINERAL BALANCES AND VITAMIN EXCRETION.
C. Frank Consolazio, LeRoy O. Matoush, Herman L. Johnson, Harry J. Krzywicki, Gerhard J. Isaac, and Norman F. Witt (Fitzsimons Gen. Hosp., U.S. Army Med. Res. and Nutr. Lab., Denver, Colo.).
American Journal of Clinical Nutrition, vol. 21, Aug. 1968, p. 803–812. 22 refs.

Eight young, healthy adults consumed 420 kcal. of carbohydrate per day for a period of 10 days. The men were assigned to two groups of four men each, one group receiving mineral supplementation and the other no additional minerals. Daily energy expenditure was maintained at the 3,200 kcal. level. Nitrogen balances were not as negative as during 10 days of complete starvation; however, nitrogen losses were still marked indicating that the effects of limited carbohydrate upon reducing protein catabolism were minimal. Mineral supplementation did not affect nitrogen balance. After three days of carbohydrate alone, urinary mineral excretion was reduced drastically, showing the rapid adaptation to the absence of dietary minerals. Mineral supplementation maintained mineral balances with the exception of potassium. Urinary vitamin excretions decreased rapidly during the restriction period when no vitamins were being ingested. From the observed data, ketosis was eliminated with only 420 kcal./day and it was apparent that mineral supplementation was very beneficial in maintaining mineral balances and normal electroencephalic patterns. However, protein catabolism was high in both groups suggesting that these low intake levels were inadequate for active individuals, even for short periods of time.

A68-82114
THE FUNCTION OF THE OTOLITH ORGANS.
Hiroshi Sasaki (Tottori U., School of Med., Dept. of Oto-Rhino-Laryngol., Yonago, Tottori-Ken, Japan).
Yonago Acta Medica, vol. 11, Oct. 1967, p. 133–140. 6 refs.

The function of the otolith organs during linear acceleration is discussed. The maculae of the sacculus and utriculus appear to form one-fourth of the rotatory oval surface from the standpoint of structural function. Both feel linear acceleration in the direction vertical to themselves. Pressure and traction are effective and especially the pressure stimulus predominates to other. A powerful duplication in function was found between both maculae. It was shown that they are able to feel linear acceleration from every direction with both of them working together.

A68-82115
EFFECTS OF RESPONSE UNCERTAINTY AND DEGREE OF KNOWLEDGE ON SUBJECTIVE UNCERTAINTY.
Robert D. Hoge (Carleton U., Northfield, Minn.) and John T. Lanzetta (Dartmouth Coll., Hanover, N. H.).
Psychological Reports, vol. 22, part 2, Jun. 1968, p. 1081–1090. 10 refs.
Contract AF-49(638)-1441.

The experiment was designed to examine the effects on subjective uncertainty of variations in response uncertainty and amount of information and to explore the relationship between two indices of subjective uncertainty, confidence in decision and decision time. Eighteen subjects were exposed to a four-factor repeated measures design involving six levels of response uncertainty, two levels of "unknown information", two levels of "known information", and two orders of problem presentation. Confidence in decision was significantly affected by response uncertainty, "unknown information", "known information", and the interaction of the two information conditions. Decision time was significantly affected by response uncertainty and "known information".

A68-82116
EFFECT OF HIGH AMBIENT TEMPERATURE ON DISCRIMINATED AVOIDANCE.
Ivan Barofsky and David Hurwitz (U.S. Army Res. Inst. of Environ. Med., Natick, Mass.).
Psychological Reports, vol. 22, part 2, Jun. 1968, p. 1153–1159. 16 refs.

Four rats were trained to bar press to avoid electric shock during a five-sec. presentation of a buzzer. Following baseline training, the intertrial intervals (7.5, 15, and 30 sec.), the shock intensity (0.5, 2.0, and 4.0 ma.), and the ambient temperature conditions (25°C. and 35°C.) were varied. The animals were exposed to all conditions twice. Rectal temperatures were measured pre- and post-session. No statistically significant changes in the frequency of avoidance responses or shocks received in the heat were observed at each intertrial interval tested. Rectal temperature increased as a function of heat exposure and shock intensity although there was no significant interaction between these variables.

A68-82117
TOWARD THE DESIGN OF A GROUP: A PRELIMINARY MODEL.
Maynard W. Shelly and Andrew C. Stedry (Kan., U., Lawrence and Carnegie Inst. of Technol., Pittsburgh, Pa.).
Psychological Reports, vol. 22, part 2, Jun. 1968, p. 1177–1189. 8 refs.
Contracts NONR 760 (24) NR 047-048 and ONR N00014-66-C0173; Ford Found. supported research.

Some assumptions, criteria, and a model for group interaction based on linear programming are presented. The efforts are viewed as a preliminary step toward the formalized design of groups. A numerical example is provided for clarity, and some of the implications of the particular model developed are suggested.

A68-82118
EFFECTS OF HYPERCAPNIA ON THE CARDIOVASCULAR SYSTEM OF CONSCIOUS DOGS.
Lawrence D. Horwitz, Vernon S. Bishop, and Hubert L. Stone (USAF School of Aerospace Med., Brooks AFB, Tex.).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 346–348. 12 refs.

Six conscious dogs were exposed for 30 min. to 6% carbon dioxide (PCO_2 45 mm. Hg) at ambient atmospheric pressure and oxygen tension in an environmental chamber. Mean cardiac output fell from a control of 194 to 170 ml./min. per kg. during the first three min. of exposure. Heart rate also fell but stroke volume was unaltered. Right arterial pressure, left arterial pressure, and pulmonary artery pressure rose; systemic arterial pressure, pulmonary vascular resistance, and systemic vascular resitance did not change. The bradycardia persisted but all pressures and cardiac output were not significantly different from the control by the end of the experimental period.

A68-82119
PREDICTABILITY OF LEAN BODY WEIGHT THROUGH ANTHROPOMETRIC ASSESSMENT IN COLLEGE MEN.
Jack H. Wilmore and Albert R. Behnke (Calif., U., School of Public Health and Dept. of Phys. Educ., Berkeley).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 349–355. 23 refs.
Calif., U. supported research.

The lean body weights of 54 male college students were estimated by the densitometric, underwater weighing technique. The resulting values were used as the criteria for evaluating the ability to predict lean body weight (LBW) from various body diameters. Also, fractional and total lung volumes and several functional respiratory tests were assessed to determine the validity of using one or more of these measures to estimate residual lung volume. The mean values for LBW, percentage of fat, the anthropometric measures, and the lung volumes were very close to previously established norms. Residual lung volume exhibited extremely low correlations with the other lung volumes, indicating the necessity for measuring this variable directly rather than relying on its estimation from prediction equations. The anthropometric predictions of LBW correlated highly with the density-specific gravity estimations of LBW ($r = 0.87$ to $r = 0.92$), and their means were within 0.09–0.59 kg. of one another, with the standard error of estimate being only 2.54 kg. LBW was predicted equally well by either of two different antropometric equations and by any one of 12 various combinations of body diameters.

A68-82120
HYPOXIC CONSTRICTION OF PULMONARY ARTERY AND VEIN IN INTACT DOGS.
Beverly C. Morgan, Sue C. Church, and Warren G. Guntheroth (Wash., U., School of Med., Dept. of Pediat., Seattle).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 356–361. 30 refs.
Grants PHS HE-03998 and PHS HE 7945; Life Insurance Med. Res. Fund supported research.

The effect of hypoxia on the pulmonary circulation of intact dogs was studied by means of flowmeters, pressure cannulae, and dimension transducers after the animals had recovered from surgery. Breathing hypoxic mixtures produced an increase in the depth and rate of inspiration in all animals, an increase in cardiac output, and a rise in pulmonary arterial and systemic arterial pressure. Pulmonary vein pressure and mean intrapleural pressure decreased with hypoxia, but the distending pressure in the pulmonary vein rose during hypoxia in all animals due to a greater fall in mean intrapleural pressure. Active pulmonary venous constriction was demonstrated in 83% of the experiments, since the diameter either decreased or was unchanged in the presence of increased distending pressure. Pulmonary artery diameter and pressure increased simultaneously in most animals; however, in three out of nine experiments, pulmonary artery diameter remained unchanged despite significant increase in pulmonary artery pressure, demonstrating arterial constriction.

A68-82121
USE OF THE OXYGEN ELECTRODE IN RECORDING OXYGEN TENSION IN AVIAN BLOOD.
T. E. Nightingale, R. A. Boster, and M. R. Fedde (Kan. State U., Dept. of Physiol. Sci., Manhattan).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 371–375. 20 refs.
Grant NSF GB 3594.

Comparisons between oxygen tensions in fluid (PO_{2f}) and gaseous (PO_{2g}) phases after *in vitro* equilibration of several fluids with gases containing various oxygen tensions were made to determine the reliability of the microcathode oxygen electrode (Beckman) for tension measurements in fluids. Identical readings were obtained for PO_{2f} and PO_{2g} when doubly distilled, deionized water was equilibrated with oxygen. When tap water, 0.128 $_M$ NaCl, 1.0 $_M$ NaCl, canine blood, and chicken blood plasma were equilibrated with oxygen, the PO_{2f} readings were approximately 5% lower than the PO_{2g} readings ($b = 0.934–0.966$). PO_{2f} readings from equilibrated fresh chicken blood of normal hematocrit (35 vol.%) were considerably lower than the PO_{2g} readings ($b = 0.873$). Alteration of the hematocrit produced notable changes in the relationship. The large $PO_{2f}–PO_{2g}$ differences observed in chicken blood may be due to an oxygen diffusion problem related to the presence of nucleated erythrocytes. Calibration of the oxygen electrode with samples of the fluid being analyzed instead of with gas is recommended.

A68-82122
EFFECT OF ADRENERGIC BLOCKADE ON THE METABOLIC RESPONSE TO HEMORRHAGIC SHOCK.
D. F. J. Halmagyi, M. H. Irving, and D. Varga (Sydney, U., Dept. of Surg., Gordon Craig Res. Lab., Australia).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 384–389. 22 refs.
Grant NHF 474/393; Imp. Chem. Ind., Ltd. and Smith, Kline and French Labs. (Australia) Pty. Ltd. supported research.

Metabolic response to blood loss was studied in nonmedicated dogs and sheep and in sheep subjected to partial (α or β) and complete ($\alpha+\beta$) adrenergic blockade. Arterial blood $H+$, CO_2, HCO_3-, lactic and pyruvic acids, glucose and plasma nonesterified fatty acid concentrations were measured. The metabolic response to hemorrhagic shock was not significantly modified by blockade of α- or β-adrenergic receptors. Complete ($\alpha+\beta$) adrenergic blockade abolished metabolic acidosis by reducing lactacidemia and prevented the rise in excess lactate but did not significantly affect the increase in plasma nonesterified fatty acid level and blood glucose.

A68-82123
TRANSIENTS IN VENTILATION AT START AND END OF EXERCISE.
William L. Beaver and Karlman Wasserman (Calif., U., School of Med., Los Angeles; Harbor Gen. Hosp., Dept. of Med., Torrance, Calif.; and Varian Associates, Palo Alto, Calif.).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 390–399. 17 refs.
Grant PHS 06591 and Varian Associates supported research.

Instantaneously acting neurogenic components of exercise ventilation were evaluated by studying the ventilatory response of human subjects to the sudden onset and offset of heavy cycling exercise variably interspersed with periods of rest or loadless pedaling. The objective of this study was to obtain an accurate description of the behavior of the ventilatory system when challenged by exercise and to evaluate the importance of motion in the ventilatory response. Minute ventilation, heart rate, and end-tidal CO_2 tension from 8 to 12 exercise periods for each subject were time-averaged every 0.01 min. to minimized random fluctuations and emphasize the aspects of the response related to change in physical activity. The ventilatory responses from rest to exercise and exercise to rest were sometimes abrupt, but often gradual or delayed. There is little contrast in the ventilatory transients between immobility during the rest phase and continued, but loadless motion, tending to refute the importance of reflex proprioceptive stimuli to ventilation during exercise.

A68-82124
MAXIMAL OXYGEN UPTAKE AND CARDIAC OUTPUT AFTER 2 WEEKS AT 4,300 M.
Bengt Saltin, Robert F. Grover, C. Gunnar Blomqvist, L. Howard Hartley, and Robert L. Johnson, Jr. (Tex. U., Southwestern Med. School, Dept. of Internal Med., Pauline and Adolph Weinberger Lab. for Cardiovascular Res., Dallas and Colo., U., Med. Center, Dept. of Med., Denver).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 400–409. 33 refs.
Contract DA-49-193-MD-2551, Grants PHS HE 07744, PHS HE 06296, PHS K3-HE-29,237, and PHS HE-32645.

The effects of two wk. acclimatization at an altitude of 4,300 m. on maximal oxygen uptake (V_{O_2}), maximal cardiac output, the electrocardiogram, and arterial blood gases in four physically trained college students during heavy exercise were measured. Immediately following ascent, maximal oxygen uptake was reduced 30%. Even though blood hemoglobin concentration increased approximately 13% and alveolar ventilation increased during the sojourn at high altitude, there was not an associated increase in maximal oxygen consumption. The improvement in maximal V_{O_2} expected from the higher hemoglobin concentration and the higher alveolar ventilation after two wk. at 4,300 m. was offset by a 20% fall in maximal cardiac output. The lower maximal cardiac output was due predominantly to a lower stroke volume (15-20%) although two subjects also had lower maximal heart rates (20–25 beats/min.). The reduced maximal cardiac output and stroke volume were only partially reversed by breathing an oxygen-enriched atmosphere. There were no electrocardiographic changes to suggest myocardial ischemia, nor did right axis deviation develop.

A68-82125
PLASMA RENIN ACTIVITY DURING SUPINE EXERCISE IN OFFSPRING OF HYPERTENSIVE PARENTS.
Alfred F. Fasola, B. L. Martz, and Oscar M. Helmer (Ind. U., School of Med., Dept. of Med. and Marion County Gen. Hosp., Lilly Lab. for Clin. Res., Sunnyside Guild Pulmonary Function Lab., Indianapolis).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 410–415. 21 refs.

Renin activity and renin substrate were studied at rest and during exhaustive supine exercise in 17 offspring of hypertensive parents. These data were compared to data previously obtained in normotensive and hypertensive groups. A decrease in renin activity and renin suppression (decreased responsiveness to stress) at peak exercise and throughout the postexercise period was observed in 10 of 17 offspring. These two responses were observed previously only in the hypertensive population. As a group, the offspring responded to exhaustive supine exercise with renin suppression similar to that of the hypertensives. Renin activity after 30 min. of supine rest was significantly higher in the offspring compared to normotensives and slightly higher than observed in the hypertensives. Renin substrate was significantly higher in hypertensives and offspring of hypertensive parents compared to normotensives. These studies suggest that changes in the renin-angiotensin system may actually predate the onset of the hypertensive phase and may be related to genetic or environmental

factors, or both. Renin release may play a role in the normal homeostatic mechanism and become suppressed as fixed diastolic hypertension develops.

A68-82126
A NEW DESIGN FOR AN IMPEDANCE PNEUMOGRAPH.
Wils L. Cooley and Richard L. Longini (Carnegie-Mellon U., Med. Systems Eng. Lab., Pittsburgh, Pa.).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 429–432. 10 refs.
Health Res. and Serv. Found. supported research.

The impedance pneumograph shows promise as a diagnostic instrument or long-term monitor but has not up to now been reliable enough to gain general acceptance. In previous instruments large impedance changes not directly related to breathing were mixed with the breathing signal. Our pneumograph, an automatically balanced bridge with a phase-sensitive detector, uses a guard ring around the measuring electrode, which largely eliminates this effect and greatly increases the signal due to breathing itself. Preliminary results indicate that this pneumograph can be used effectively in many situations where conventional bell spirometer measurements are difficult or impossible to make. The new unit is well adapted for monitoring and for breathing pattern studies and shows some promise for evaluating the function of separate lobes of the lung.

A68-82127
A CONSTANT-TEMPERATURE WATER BATH CALORIMETER FOR MEASURING EXTREMITY HEAT LOSS.
Russell W. Newman and John R. Breckenridge (U.S. Army Res. Inst. of Environ. Med., Natick, Mass.).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 447–449.

A technique for measuring hand or foot heat loss in water at any desired constant temperature is described and illustrated. The determination, which employs commercially available components and is independent of water volume, overcomes an undesirable feature in the usual method of calorimetry, i.e., rising temperature. Essentially, heat is extracted from a water calorimeter at a constant rate by a cooling coil and restored to the bath by a knife heater connected to a temperature controller. When extremity is immersed, it constitutes a second source of heat and the heater power input from the heater decreases accordingly. This compensatory decrease, continuously plotted against time, is equated to the extremity heat loss. Heat loss patterns from different objects in one calorimeter are compared, and differences in digital skin temperature and hand heat loss for three water temperatures are presented.

A68-82128
COMPARISON OF CARDIAC OUTPUT DETERMINED BY CARBON DIOXIDE REBREATHING AND DYE-DILUTION METHODS.
Ronald J. Ferguson, John A. Faulkner, Stevo Julius, and James Conway (Mich., U., Depts. of Phys. Educ., Physiol. and Internal Med., Ann Arbor).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 450–454. 40 refs.
Grants NIH GM-12554 and NIH CD-00081.

The reproducibility of cardiac output determined by a CO_2 rebreathing method was studied in 13 normal men, aged 22–43 yr., during sitting rest and submaximal exercise on a bicycle ergometer. The reproducibility of the CO_2 method during exercise was similar to the reproducibility reported for the direct Fick and dye-dilution methods. All duplicate determinations of cardiac output during exercise were within 15% of one another. A direct comparison was made between the cardiac output determined by the CO_2 and dye-dilution methods during sitting rest and submaximal and maximal exercise. Thirty-three of 37 paired determinations of cardiac output obtained during exercise were within 20% of one another. Although the CO_2 method was reproducible at rest, there was a low correlation ($r=0.22$) obtained between the cardiac output estimated by the CO_2 and dye-dilution methods during sitting rest. This requires further investigation. The CO_2 method is a reproducible and convenient bloodless technique for determining cardiac output in exercise.

A68-82129
TECHNIQUES FOR TELEMETRY OF CHIMPANZEE SLEEP ELECTROENCEPHALOGRAM.
D. F. Kripke and J. Bert (Aeromed. Res. Lab., Holloman AFB, N. Mex.).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 461–462.

To obtain sleep recordings of adult chimpanzees under undisturbed conditions, a method was devised to record electroencephalogram, electromyogram, electrooculogram, and electrocardiogram by FM telemetry. Animals were chronically implanted with stainless steel electrodes, and telemetry transmitters were placed in a Fiberglas box fixed above the skull. Multichannel physiological recordings of three adult chimpanzees were obtained.

A68-82130
A SAMPLED-DATA REGULATOR FOR MAINTAINING A CONSTANT ALVEOLAR CARBON DIOXIDE.
Garland H. Holloman, Jr., Howard T. Milhorn, Jr., and Thomas G. Coleman (Miss., U., Med. Center, Dept. of Physiol. and Biophysics, Jackson).
Journal of Applied Physiology, vol. 25, Oct. 1968, p. 463–468. 13 refs.
NASA Grant 25-002-015 and Grant NIH HE-09737.

A sample-data regulator for maintaining a constant alveolar CO_2 during the ventilatory transients evoked by hypoxic stimulation is presented. Since the most accessible indication of alveolar CO_2 is the end-tidal sample, the assumption is made that in normal young subjects end-tidal CO_2 is a satisfactory measurement of alveolar CO_2. This regulator provides a method of investigating both steady-state and transient responses of the respiratory system to reduced O_2 at various fixed levels of CO_2. Data from a typical subject are shown for a step change from room air to a 9% O_2 mixture with unregulated alveolar CO_2 and with the CO_2 maintained at the subject's normal resting value. Other possible uses of this type of system are discussed.

A68-82131
ALCOHOL LEVELS IN AUTOPSY HEART BLOOD.
V. D. Plueckhahn (Geelong Hosp., Victoria, Australia).
Journal of Forensic Medicine, vol. 15, Jan.–Mar. 1968, p. 12–21. 12 refs.

Samples of blood from the femoral vessels and the heart chambers were taken from 209 consecutive autopsies coming under the jurisdiction of the Coroner. Blood alcohol was present in 59 of the deceased. Statistical analysis of the alcohol level in femoral vessel and heart blood samples showed that samples of blood taken from the heart chambers give a reliable index of the amount of alcohol imbibed before death when the autopsy is performed within 48 hr. of death. Ethyl alcohol in quantities varying from 250 ml. of 10% alcohol to 500 ml. of 25% alcohol were instilled into the stomachs of 14 cadavers. Multiple samples for alcohol estimation were taken from 6 to 50 hr. later at autopsy. This investigation showed: (a) minimal diffusion of alcohol from the stomach to the blood present in the intact heart chambers occurred after death; (b) heart blood alcohol levels were seldom significantly elevated, even under markedly adverse conditions, and only one

elevation of alcohol level above 0.030% occurred; (c) significant diffusion of alcohol from the stomach to the pericardial and pleural fluid does occur after death and false alcohol levels up to 0.190% were recorded.

A68-82132
A STUDY OF THE ANATOMICAL SUBSTRATE OF OCCUPATIONAL MICROANGIOPATHY CAUSED BY VIBRATING INSTRUMENTS.

P. Pellegrini, G. Martines, C. Longhini, G. F. Musacci, G. Antonioli, and V. Colamussi (Ferrara, U., Centro Microscop. Elettronica; Ist. di Patol. Spec. Med. e Metodol. Clin.; and Insegnamento di Med. del Lavoro, Italy).

Medicina del Lavoro, vol. 59, Mar. 1968, p. 180–208. 41 refs.

A report is presented of the histological and ultrastructural pattern of the small vessels of the fingertips, as observed in biopsies of subjects with microangiopathy caused by vibrating instruments. The most marked damages, characterized by sclerotic processes, were found in the segments with mioepithelioid media of the artero-venous anastomoses of the second type, group B, according to a previous investigator. The histological and ultrastructural patterns observed are discussed and correlated with the results of the functional tests performed in the same patients, and compared with lesions of the same artero-venous anastomoses in other peripheral vessels diseases.

A68-82133
IMPROVED OXYGEN RELEASE: AN ADAPTATION OF MATURE RED CELLS TO HYPOXIA.

Miles J. Edwards, Miles J. Novy, Carrie-Lou Walters, and James Metcalfe (Ore., U., Med. School, Dept. of Med, Heart Res. Lab. and Div. of Chest Diseases, Portland).

Journal of Clinical Investigation, vol. 47, Aug. 1968, p. 1851–1857. 28 refs.
Western Soc. for Clin. Res., 21st Ann. Meeting, Carmel, Calif., Feb. 2, 1968.
Grants NHI HE 5499, NHI 06042, and NHI HE 06336; Ore. Heart Assn. supported research.

Blood from patients with erythrocytosis secondary to arterial hypoxemia due either to congenital heart disease or to chronic obstructive pulmonary disease was shown to have a decreased affinity for oxygen; the average oxygen pressure required to produce 50% saturation of hemoglobin with oxygen was 29.8 mm. Hg (average normal, 26.3 mm. Hg). Such a displacement of the blood oxygen equilibrium curve promotes the release of oxygen from blood to the tissues. Studies were also performed upon blood from a man with complete erythrocyte aplasia who received all of his red cells by transfusion from presumably normal persons. With mild anemia (hematocrit, 28%), the affinity of his blood for oxygen was slightly diminished (an oxygen pressure of 27.0 mm. Hg was required to produce 50% saturation of hemoglobin with oxygen). With severe anemia (hematocrit, 13.5%), however, his blood had a markedly decreased oxygen affinity (an oxygen pressure of 29.6 mm. Hg was required to produce 50% saturation of hemoglobin with oxygen). It was concluded that patients with various conditions characterized by an impairment in the oxygen supply system to tissues respond with a diminished affinity of their blood for oxygen. Although the mechanism which brings about this adaptation is not known, the displacement of the oxygen equilibrium curve is associated with an increase in heme–heme interaction. The decrease in blood oxygen affinity need not occur during erythropoiesis, but may be imposed upon mature circulating red cells.

A68-82134
EFFECTS OF EXCITATORY AND TRANQUILIZING DRUGS ON VISUAL PERCEPTION.

Richard M. Hill, Roland Fischer, and Diana Warshay (Ohio State U., Coll. of Optometry and Coll. of Med., Columbus).

American Journal of Optometry and Archives of American Academy of Optometry, vol. 45, Jul. 1968, p. 454–457. 9 refs.
Am. Acad. of Optometry, Ann. Meeting, Chicago, Dec. 11, 1967.
PHS, NIH, and Ohio State U. supported research.

Changes of spatial distortion threshold in response to the hallucinogen, psilocybin, were measured. A marked loss of compensation for optically induced distortions at drug peak was found. Compensation returned as the drug course elapsed.

A68-82135
EFFECTS OF INTERMITTENT ILLUMINATION ON VISUAL ACUITY.

S. Howard Bartley and Richard J. Ball (Mich. State U., Dept. of Psychol., Lab. for Study of Vision and Related Sensory Processes, East Lansing).

American Journal of Optometry and Archives of American Academy of Optometry, vol. 45, Jul. 1968, p. 458–464. 17 refs.
Am. Acad. of Optometry, Ann. Meeting, Chicago, Dec. 9, 1967.
Grant PHS NB 05260-04.

A study of visual acuity under intermittent illumination utilizing a Landolt C target has shown that certain rates and pulse/cycle fractions produce a decrement in visual acuity. This decrement was greater with a black C on a white background than with the reverse contrast condition. Results also depended on illumination level, viewing time and psychophysical method utilized.

A68-82136
CORNEAL INJURY THRESHOLD TO CARBON DIOXIDE LASER IRRADIATION.

Ben S. Fine (Armed Forces Inst. of Pathol., Ophthalmic Pathol. Branch and George Washington U., School of Med., Dept. of Ophthalmol., Washington, D. C.), S. Fine (Northeastern U., Dept. of Biophysics and Bio-Med. Eng., Boston, Mass.), L. Feigen, and D. MacKeen.

American Journal of Ophthalmology, vol. 66, Jul. 1968, p. 1–15. 22 refs.
Contracts DA-49-193-MD-2680, DA-49-193-MD-2436, DA-49-193-MD-2437, Grants PHS NB-05575, and PHS ROL-00361.

Rabbit eyes *in vivo* were exposed to descending-power levels of continuous CO_2 laser irradiation to determine a threshold for injury. Irradiation at a power density of 0.1 w./cm.^{2} for 30 min. was found to be noninjurious to the rabbit eye by clinical and histopathologic examinations. Mild suprathreshold injuries were examined to evaluate changes that might occur in the most superficial corneal layers and to serve as a guideline for improved histopathologic evaluation of the threshold and near-threshold injuries. A variety of morphologic changes in the corneal epithelium epithelial basement membrane, and superficial stroma in suprathreshold and near-threshold lesions are described and discussed.

A68-82137
OCULAR SPECTRAL CHARACTERISTICS AS RELATED TO HAZARDS FROM LASERS AND OTHER LIGHT SOURCES.

Walter J. Geeraets and Edward R. Berry (Va., Med. Coll., Depts. of Ophthalmol. and Biophysics, Richmond).

American Journal of Ophthalmology, vol. 66, Jul. 1968, p. 15–20.
Contract DA 49 146 XZ 416 and Old Dominion Eye Bank and Res., Inc. supported research.

Ocular spectral characteristics, including transmission through ocular media and reflection and absorption from and within retinal pigment epithelium and choroid, were given for the spectral range

350 to 1,500 nm. Data of humans, rabbits and monkeys were compared. The importance of such data with regard to estimations of retinal hazards from high intensity white light and various laser sources was discussed.

A68-82138
OCULAR HAZARDS OF TRANSSCLERAL LASER RADIATION. I. SPECTRAL REFLECTION AND TRANSMISSION OF THE SCLERA, CHOROID AND RETINA.
Richard S. Smith (NIH, Natl. Inst. of Neurol. Diseases and Blindness, Bethesda, Md.) and Marvin N. Stein (Armed Forces Inst. of Pathol, Ophthalmic Pathol. Branch, Washington, D. C.).
American Journal of Ophthalmology, vol. 66, Jul. 1968, p. 21–31. 13 refs.
Assn. for Res. in Ophthalmol., Eastern Sect. Meeting, Washington, D. C., Mar. 10–11, 1967.
U.S. Army Dept. supported research.

The widespread use of high intensity laser devices suggests the possibility of ocular injury from a laser beam transmitted through the sclera. Using human autopsy eyes and pigmented rabbit eyes, the spectral reflection and transmission characteristics of the sclera, choroid, and retina were measured by means of a spectrophotometer. Values obtained over the spectral range from 500 to 2,600 mμ. showed little variation among different specimens. Measurements made in human and rabbit eyes were qualitatively and quantitatively similar. The results obtained at 694.3 and 1,060 mμ. were confirmed by a second method, using ruby and neodymium lasers as the radiation source.

A68-82139
MECHANISM OF ABSORPTION OF CARBON DIOXIDE BY PLANT LEAVES [O MEKHANIZME ABSORBTSII UGLEKISLOTY LIST'IAMI RASTENII].
Z. I. Zhurbitskii, V. A. Gorbavtsov, and N. S. Chaplygina (USSR, Acad. of Sci., K. A. Timiriazev Inst. of Plant Physiol., Moscow).
Fiziologiia Rastenii, vol. 15, May–Jun. 1968, p. 416–421. 7 refs. In Russian.

Cucumber plants were grown in water cultures containing a complete nutrient mixture. A positive or negative potential was applied to the plants via a platinum electrode immersed in the nutrient medium. A potential of 500 v. was obtained by means of an alternating current rectifier and 60 v. from a dry battery. It was found that only negatively charged plant leaves were capable of absorbing carbon dioxide from the air. With an increase of the number of positively charged carbon dioxide ions in the air, the rate of photosynthesis was also found to increase. It is concluded that absorption of carbon dioxide is a result of attraction of positive carbon dioxide ions to negatively charged plant leaves. Precisely such a charge distribution is usually observed under natural conditions.

A68-82140
PHYSIOLOGICAL AND BIOCHEMICAL VARIATIONS OF SEEDLINGS OF *VICIA FABA* IN A STATIONARY MAGNETIC FIELD [FIZIOLOGO-BIOKHIMICHESKIE IZMENENIIA PROROSTKOV BOBOV V POSTOIANNOM MAGNITNOM POLE].
G. A. Tarakanova (USSR, Acad. of Sci., K. A. Timiriazev Inst. of Plant Physiol., Moscow).
Fiziologiia Rastenii, vol. 15, May–Jun. 1968, p. 450–456. 25 refs. In Russian.

The effect of short and long duration magnetic fields of various intensities (20, 4,000 and 12,000 oersteds) on the coupling of oxidative phosphorylation and on the growth of the roots of 1 to 30 day old *Vicia faba* plants was studied. Weak (20 oersteds) fields accelerate and strong fields (4,000 and 12,000 oersteds) slow down growth. The stimulatory effect of DNP on respiration increases in weak magnetic fields and drops in strong fields, irrespective of the duration of action of the field. This could signify that the degree of coupling between oxidation and phosphorylation is higher in the first case and lower in the second. Short action (one hr.) of a 4,000 oersted magnetic field also increases the coupling of oxidative phosphorylation. It is concluded that the pathologic changes in the metabolism of plants located in a magnetic field develop gradually. They depend on the field strength and duration of action of the field on the plant.

A68-82141
SOME FEATURES OF NITRATE ASSIMILATION BY PHOTOSYNTHETIC LEAVES [OSOBENNOSTI ASSIMILIATSII NITRATOV FOTOSINTEZIRUIUSHCHIMI LIST'IAMI].
G. A. Slobodskaia (USSR, Acad. of Sci., K. A. Timiriazev Inst. of Plant Physiol., Moscow).
Fiziologiia Rastenii, vol. 15, May–Jun., 1968, p. 511–520. 25 refs. In Russian.

The CO_2 dependence of nitrate assimilation is primarily determined by the nitrate content in the leaves. At low NO_3^- concentrations the highest assimilation rate is observed at CO_2 concentrations of 0.03 to 0.04 vol. %. Increase of the CO_2 concentrations results in suppression of NO_3^- assimilation. At high NO_e^- concentrations in the leaf an increase of CO_2 concentration results in enhancement of nitrate assimilation. This process can proceed by several paths in light. The photosynthetic path of nitrate assimilation is dominant in leaves with an ample supply of nitrates. Nitrate content is one of the factors influencing the course of light and carbon dioxide curves of photosynthesis.

A68-82142
PRODUCTION OF POLYSACCHARIDES BY GREEN PHOTOSYNTHETIC BACTERIA [OBRAZOVANIE POLISAKHARIDOV ZELENYMI FOTOSINTEZIRUIUSHCHIMI BAKTERIIAMI].
E. N. Kondrat'eva, E. N. Krasil'nikova, and L. M. Novikova (M. V. Lomonosov Moscow State U., USSR).
Mikrobiologiia, vol. 37, no. 3, 1968, p. 417–424. 35 refs. In Russian.

The polysaccharide content of *Chloropseudomonas ethylicum*, strain 3, cells sharply increases when the bacteria utilize acetate, ethanol and pyruvate under conditions of nitrogen deficit. Polysaccharide accumulation by the green bacteria was found during their incubation in light and depended on bicarbonate in the case of utilization of acetate or ethanol. An increase of polysaccharides in the cells of *Chl. ethylicum* takes place at the expense of carbohydrate fraction extracted with KOH and containing mainly glucose. Unlike purple bacteria, *Chl. ethylicum* does not accumulate poly-β-hydroxybutyric acid in the cells when growing on acetate or ethanol.

A68-82143
BACTERIOPHAGE FOR BACTERIA BELONGING TO HYDROGENOMONAS GENUS [O BAKTERIOFAGE BAKTERII IZ ROLA HYDROGENOMONAS].
E. S. Khavina, N. D. Savel'eva, and IA. I. Rautenshtein (USSR, Acad. of Sci., Inst. of Microbiol., Moscow).
Mikrobiologiia, vol. 37, no. 3, 1968, p. 471–476. 7 refs. In Russian.

Twenty samples of soil, silt, water and manure were tested for a phage active against hydrogen-oxidizing bacteria. The phage was isolated only from humus. This phage H-20 was a specific one; it brought about lysis of only two closely related cultures

among 12 cultures belonging to different *Hydrogenomonas* strains. According to its morphology the phase H-20 belongs to phages having a tail of complex structure with a contractible sheath. Phage head is an octahedron looking like hexahedron in plane. The head has a diameter of about 1,000 Å. The tail (2,000 × 1,200) has at its end a basal plate with fibers. This is a first observation of phagolysis of a chemoautotropic microorganism under autotrophic conditions.

A68-82144

CHANGES IN ACTIVITY OF THE REACTION OF PENTOSOPHOSPHATE CYCLE AND GLYCOLYSIS IN RAT ERYTHROCYTES UNDER ADAPTATION TO HYPOXIA [IZMENENIE AKTIVNOSTI REAKTSII PENTOZOFOSFATNOGO TSIKLA I GLIKOLIZA V ERITROTSITAKH KRYS PRI ADAPTATSII K GIPOKSII].

L. N. Simanovskii (USSR, Acad. of Sci., I. M. Sechenov Inst. of Evolutionary Physiol. and Biochem., Leningrad).

Biokhimiia, vol. 33, Jan.–Feb. 1968, p. 15–19. 30 refs. In Russian.

The influence of adaptation to hypoxia on the activity of pentosophosphate cycle and glycolysis in rat enthrocytes was studied. A distinct activation of the transketolase reaction and glycolysis was shown to arise. An increase in the activity of the glucose-6-phosphate dehydrogenase reaction on the 20th day and its decrease on the 30th day of adaptation were also found. The changes observed may, apparently, be regarded as one of stages of biochemical adaptation to hypoxia.

A68-82145

OXIDATIVE PHOSPHORYLATION IN LIVER AND SKELETAL MUSCLES OF GROUND SQUIRRELS BY VARIOUS PHYSIOLOGICAL CONDITIONS [OKISLITEL'NOE FOSFORILIROVANIE V PECHENI I SKELETNYKH MYSHTSAKH SUSLIKOV PRI RAZLICHNYKH FIZIOLOGICHESKIKH SOSTOIANNIAKH].

G. M. Daudova (USSR, Acad. of Med. Sci., Inst. of Exptl. Med., Dept. of Gen. Pathol., Leningrad).

Biokhimiia, vol. 33, Jan.–Feb. 1968, p. 148–153. 18 refs. In Russian.

The present study was concerned with respiration and phosphorylation in mitochrondria isolated from liver and muscles of ground squirrels in the active state, during hibernation and at the period of awakening from hibernation. It was shown that oxygen uptake by isolated and washed mitochrondria from liver of active and hibernating animals is the same and increases somewhat at the period of awakening. Preservation of the remainder of supernatant in the fraction of isolated, but previously not washed mitochondria, caused marked decrease in utilization of oxygen by hibernation. The level of stimulation of respiration in mitochondria from liver of hibernating, awakening and active ground squirrels on addition of hexokinase and glucose (respiratory control), was essentially the same. At the period of hibernation and awakening, the level of oxidative phosphorylation (coefficient P/O) determined *in vitro* in isolated mitocondria from liver and skeletal muscles on addition of hexokinase and glucose to the incubation system, remained at the level of active ground squirrels. Mitochondria isolated from liver and skeletal muscles of hibernating and awakening hibernators completely preserved their potential high level of respiration and phosphorylation typical of mitochondria from liver and skeletal muscles of active animals.

A68-82146

THE INFLUENCE OF SUBCUTANEOUS ADMINISTRATION OF NORADRENALINE ON OXYGEN CONSUMPTION BY MICE TRAINED TO COLD AND PHYSICAL EXERCISE [VLIIANIE PODKOZHNOGO VVEDENIIA NORADRENALINA NA POTREBLENIE KISLORODA MYSHAMI, TRENIROVANNYMI K KHOLODU I FIZICHESKOI NAGRUZKE].

T. A. Allik and I. N. Ivashkina (M. V. Lomonosov Moscow U. and Central Sci.-Res. Inst. of Phys. Cult., USSR).

Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 65, Mar. 1968, p. 21–24. 10 refs. In Russian.

In 70% of control mice injection of a large dose of noradrenaline reduced oxygen consumption. Small doses (0.5 μg./g.) produced but a slight rise in the consumption of oxygen. In cold resistant mice injection of 0.5 μg./g. of noradrenaline doubled the oxygen consumption, but after 30 to 40 min. respiration reverted to normal. Physically trained mice reacted to this dose somewhat less than the cold acclimatized group. Increase of the dose of noradrenaline to 5 μg./g. produced no further increase of oxygen consumption. Dose of 10 μg./g. was found to be critical both for the control animals and the acclimatized group, but the members of the first group always died with markedly decreased oxygen consumption, while the acclimatized group succumbed with very high oxygen consumption.

A68-82147

MECHANISMS OF ARTERIAL PRESSURE CHANGES AND HEART RATE IN ACUTE HYPOXIC HYPOXIA [O MEKHANIZMAKH IZMENENII ARTERIAL'NOGO DAVLENIIA I CHASTOTY SERDECHNYKH SOKRASHCHENII PRI OSTROI GIPOKSICHESKOI GIPOKSII].

L. I. Ardashnikova (USSR, Acad. of Med. Sci., Inst. of Normal and Pathol. Physiol., Lab. of Physiol. and Pathol. Respiration and Blood Circulation, Moscow).

Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 65, Mar. 1968, p. 25–29. 14 refs. In Russian.

The author studied the significance of stimulation of chemoreceptors of carotid sinus, minute respiratory volume (MRV) and pCO_2 in arterial blood, changes of heart rate and arterial blood pressure appearing as a result of transient hypoxic hypoxia. Changes in the heart rate were related to changes of MRV. In experiments with controlled respiration which corresponded to the initial MRV bradycardia was more pronounced than with normal and controlled respiration with increased MRV. Normo- and hypocapnia exerted no influence on the heart rate. Slight drop of arterial pressure which supervened during hypoxia was unrelated to above three factors (stimulation of chemoreceptors, MRV and hypocapnia). It is stressed that chemoreceptors of the carotid sinus which play an exceedingly important role in respiration control play a much lesser role in the control of circulation in hypoxia.

A68-82148

MORPHOLOGICAL AND BIOCHEMICAL CHANGES IN THE CARDIOVASCULAR SYSTEM OF DOGS AFTER REPEATED INFLUENCE OF RADIAL ACCELERATION [MORFOLOGICHESKIE I BIOKHMICHESKIE IZMENENIIA V SERDECHNO-SOSUDISTOI SISTEME SOBAK S EKSPERIMENTAL'NOI GIPERKHOLESTERINEMIEI, PODVERGAVSHIKHSIA VOZDEISTVIIU RADIAL'NYKH USKORENII].

E. D. Klimenko, G. V. Chernysheva, and V. E. Potkin (USSR, Acad. of Med. Sci., Inst. of Normal and Pathol. Physiol., Lab. of Biochem. and Lab. of Morphol., Moscow).

Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 65, Mar. 1968, p. 32–36. 11 refs. In Russian.

The authors studied the cardiovascular system of dogs fed with cholesterol (two g./kg. body weight for five to six mo.) and subjected repeatedly to radial accelerations (up to two yr.). Thick plaques in intima, lipidoses, xanthomatosis were found in fine intramuscular branches of the coronary arteries; in other vessels early stages of atherosclerosis were found. Lipid infiltration was

preceded by accumulation of interstitial substance with increase of acid mucopolysaccharides. Biochemical tests showed increased ability of myocardium to make use of the energy of macroergic phosphorus compounds. Along with pathological changes compensatory adaptation reactions were also observed.

A68-82149
THE INFLUENCE OF OXYGEN ATMOSPHERE ON ERYTHROPOIESIS [VLIIANIE DYKHANIIA CHISTYM KISLORODOM NA ERITROPOEZ].
I. S. Breslav, O. V. Klestova, O. I. Moiseeva, and A. M. Shmeleva (USSR, Acad. of Sci., I. P. Pavlov Inst. of Physiol., Lab. of Exptl. and Clin. Hematol. and Lab. of Physiol. of Respiration, Leningrad).
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 65, Mar. 1968, p. 39–42. 21 refs. In Russian.

After 40 hr. exposure of rats to pure oxygen the erythrocyte level and hemoglobin in the peripheral blood rose while the number of erythroblasts in the bone marrow decreased. When animals were transferred to the usual atmospheric air the number of erythrocytes dropped rapidly (maximum drop towards the fifth day), while inhibition of erythropoiesis in the bone marrow continued. Animal plasma was able to decrease mitotic activity of the erythroblasts in the bone marrow culture. It was concluded that hyperoxia gives rise to an erythropoietic inhibitor in the blood of experimental animals, which in rabbits inhibits erythropoiesis both *in vitro* and *in vivo*.

A68-82150
THE INFLUENCE OF CERTAIN RADIATION PROTECTION AGENTS ON THE JUXTAMURAL DIGESTION IN IRRADIATED ANIMALS [VLIIANIE NEKOTORYKH RADIOZASHCHITNYKH SREDSTV NA PRISTENOCHNOE PISHCHEVARENIE U OBLUCHENNYKH ZHIVOTNYKH].
A. V. Lazovskaia and V. Iu. Domanskii (Central Sci.-Res. Roentgen-Radiol. Inst., Pathophysiol. Lab., Leningrad, USSR).
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 65, Mar. 1968, p. 43–47. 22 refs. In Russian.

The authors studied prophylatic action of anti-radiation agents from the group of aminothiolic compounds (mercamine, AET, monosodium salt of beta-aminoethylthiophosphoric acid) and of indolylalkylamines (serotonin, 5-metoxytryptamine) on the state of juxtamural digestion in the small intestine of rats irradiated with 700 r. Invertase activity of the intestine was used to assess the state of juxtamural digestion. Experiments were made three days after irradiation at a period when in irradiated and unprotected animals depression of invertase activity was at its highest. It was found that radiation protectors of the aminomercaptan group exert a marked protective effect as far as the enzymatic activity of invertase was concerned, practically preventing its changes. Mercamine was the most active in this respect. Amine protectors were much less effective as far invertase was concerned than the sulphur containing compounds. Experiments on intact animals showed that mercamine and AET themselves depressed invertase activity, while serotonin and 5-metoxytryptamine exerted no such effect.

A68-82151
EFFECT OF OZONATION ON AROMATIC, PARTICULARLY CANCEROGENIC CARBOHYDRATES [VLIIANIE OZONIROVANIIA NA AROMATICHESKIE, V CHASTNOSTI KANTSEROGENNYE, UGLEVODORODY].
A. P. Il'nitskii, A. Ia. Khesina, S. N. Cherkinskii, and L. M. Shabad (USSR, Acad. of Med. Sci., Inst. of Exptl. and Clin. Oncol. and I Moscow Med. Inst., Dept. of Communal Hyg., Moscow).
Gigiena i Sanitariia, no. 3, Mar. 1968, p. 8–11. 11 refs. In Russian.

Solutions of five aromatic carbohydrates were ozonized: 3,4-benzpyrene (BP), 1,2-benzanthracene, 1,2,5,6-dibenzathracene pyrene and 9,10-dimethyl-1,2-benzathracene (DMBA). Ozone had a strong destructive effect on carbohydrates. BP proved to be the most resistant to the action of ozone and DMBA was the least resistant. The sanitary significance of BP in relation to carbohydrate contamination was discussed. A different degree of BP resistance to ozone was noted in relation to its state (in solution, absorbed by soil particles, etc.). The hygienic significance of the results obtained was stressed.

A68-82152
EMBRYOTROPIC ACTION OF BENZOL AND FORMALDEHYDE ON EXPERIMENTAL INTRODUCTION BY THE RESPIRATORY ROUTE [EMBRIOTROPNOE DEISTVIE BENZOLA I FORMAL'DEGIDA PRI INGALIATSIONNOM PUTI VOZDEISTVIIA V EKSPERIMENTE].
V. A. Gofmekler (USSR, Acad. of Med. Sci., A. N. Sysin Inst. of Gen. and Communal Hyg., Moscow).
Gigiena i Sanitariia, no. 3, Mar. 1968, p. 12–16. 17 refs. In Russian.

The paper presents a short survey of literature on the effect of environmental factors on embryonic development, as well as experimental findings concerning the effect of benzol and formaldehyde inhalation for 24 hr. on the embryonic development of the first posterity of albino rats. Tests were carried out with benzol at concentrations of 670, 63.3, 56.6, 20.4, 5.6, and 1 mg./m.^{3} and with formaldehyde at concentrations of 1 and 0.012 mg/m.^{3}. Findings on the changes of weight (newborn rats, relative weight of their organs), on the length of gestation and the number of embryos in an animal served as indices of the embryotropic action of the investigated substances. It was concluded that much smaller concentrations of benzol and formaldehyde produced an embryotropic effect than those affecting adult male albino rats.

A68-82153
HYGIENIC STANDARDIZATION OF ETHYLENE GLYCOL AND DIETHYLENGLYCOL CONTENTS IN SANITARY PROTECTION OF WATER BODIES [ETILENGLIKOL' I DIETILENGLIKOL' KAK OB"EKTY GIGIENICHESKOGO NORMIROVANIIA V SANITARNOI OKHRANE VODOEMOV].
V. P. Plugin (USSR, Acad. of Med. Sci., A. N. Sysin Inst. of Gen. and Communal Hyg., Moscow).
Gigiena i Sanitariia, no. 3, Mar. 1968, p. 16–22. 10 refs. In Russian.

The effect of ethylene glycol and the product of its polycondensation, diethylene glycol, on the organoleptic properties of water, the sanitary regime of bodies of water and the body of warm blooded animals in oral introduction was studied. The threshold concentrations of ethylene glycol for the effect on organoleptic properties of water amounted to 1,320 mg./l. (smell) and 450 mg./l. (after-taste), diethylene glycol 3,370 mg./l. (smell) and 2,060 mg./l. (after-taste). The threshold value of both substances for the effect of the general sanitary regime of bodies of water equaled one mg./l. A chronic sanitary toxicologic test was carried out on two kinds of laboratory animals, rabbits and albino rats. The inefficient dose for both substances amounted to 0.05 mg./kg. (one mg./l.). The maximum permissible concentration of ethylene glycol and diethylene glycol is suggested to be set at a level of one mg./l. according to their sanitary-toxicologic noxious effect.

A68-82154
CHANGE OF THE ELECTRIC ACTIVITY OF MUSCLES IN THE ACTION OF VIBRATION AND NOISE. [IZMENENIE

ELEKTRICHESKOI AKTIVNOSTI MYSHTS PRI VOZDEISTVII VIBRATSII I SHUMA].

A. F. Lebedeva (Sanit.-Hyg. Med. Inst., Leningrad, USSR).

Gigiena i Sanitariia, no. 3, Mar. 1968, p. 25–30. 5 refs. In Russian.

Changes of the electrical activity of muscles of rats in response to vibration and noise were investigated. It was found that short-term action of vibration and noise simulation produced an augmentation of the integral electroactivity. An extremely pronounced increase of biocurrents in comparison with the initial intensity and that of the control groups was noted in the first 10 min. of vibration and noise. An increase of the time of action to 15 min. and more caused a gradual inhibition of the biocurrents. This reaction was more pronounced as the time of the stimulation action was prolonged. Restoration of the reaction to normal did not occur for one hr. after ceasing the stimulation. In the action of medium frequency noise, the reaction was less pronounced. The integral electroactivity of muscles increased during the first minute only; later oscillations of the biopotentials did not exceed the average initial values and those of the control group.

A68-82155

TARGET RECOGNITION ON TV AS A FUNCTION OF HORIZONTAL RESOLUTION AND SHADES OF GRAY.

Dorothy M. Johnston (North Am. Rockwell Corp., Columbus, Ohio).

Human Factors, vol. 10, Jun. 1968, p. 201–209. 8 refs.

The purpose of this study was to determine the effects of horizontal resolution and shades of gray on target recognition. Phase I of the study determined target recognition time on a TV display when the subjects were permitted an external cockpit view of the targets on the terrain model. Phase II determined target recognition time and probability when the subjects were not permitted an external cockpit view of the terrain. A closed circuit television system was used in conjunction with a terrain model for static presentations to the subjects. The results from Phase I revealed reliable differences in target recognition time as a function of horizontal resolution; shades of gray; slant range; resolution and slant range interaction; shades of gray and slant range interaction; and resolution, shades of gray and slant range interactions. Phase II results showed reliable differences in target recognition time and probability as a function of resolution and slant range.

A68-82156

EFFECT OF COLD EXPOSURE ON THE METABOLISM OF UBIQUINONE IN THE RAT.

H. N. Aithal, V. C. Joshi, and T. Ramasarma (Indian Inst. of Sci., Dept. of Biochem., Bangalore).

Biochimica et Biophysica Acta, vol. 162, Jul. 16, 1968, p. 66–72. 21 refs.

Indian Council of Med. Res. supported research.

Accumulation of ubiquinone in the livers of rats exposed to a cold environment was shown to be due to both decreased catabolism during the entire experimental period and increased synthesis during an intermediate stage (10 to 20 days). The increased endogenous synthesis in the cold-exposed rats was eliminated when ubiquinone in the liver after exposure for 40 days (coinciding with acclimatization), or by absorption of the exogenous dietary supply, possibly by the mechanism of end-product regulation.

A68-82157

EFFECT OF THE INTESTINAL BACTERIAL FLORA ON ACUTE GASTRIC STRESS ULCERATION.

Chester B. Rosoff and Harvey Goldman (Beth Israel Hosp., Depts. of Surg. and Pathol. and Harvard Med. School, Boston, Mass.).

Gastroenterology, vol. 55, Aug. 1968, p. 212–222. 34 refs.

Am. Federation for Clin. Res., Sect. Meeting, New York, Dec. 1966.

Grants PHS AI 06398 and PHS HE10957.

Significant protection against acute gastric ulceration which follows restraint stress is provided by the oral administration of polymyxin B. The nonabsorbable antibiotic sharply reduces the number of coliform bacteria in the intestine and the products of their growth available for absorption. This change in the flora results in a decrease in the motor tone of the stomach and cecum, and in the volume and concentration of gastric acid produced in response to the stress of immobilization. The protection offered by the coliform poor state is eliminated when endotoxin is given to antibiotic-treated animals. Systematic administration of endotoxin increases both gastric acid production and the incidence of stress ulceration in the normal flora state. It is suggested that, under the conditions induced by stress, detoxification mechanisms suffer and permit absorbed bacterial products to reach the systemic circulation and stimulate the hypothalamus. The autonomic nervous system barrage which results increases gastric motor activity and reduces blood flow, and in the presence of acid sets the stage for tissue injury. Singe hypoglycemia produces a maximal gastric secretory output which is independent of the state of the intestinal flora, and since both vagotomy and anticholinergics prevent the gastric acid response and the mucosal injury induced by restraint and by endotoxin, a central rather than a peripheral or local gastric action of the bacterial products is suggested.

A68-82158

PROTEIN STARVATION AND THE SMALL INTESTINE. 2. DISACCHARIDASE ACTIVITIES.

Jacques Prosper, Robert L. Murray, and Fred Kern, Jr. (Colo., U., Med. Center, Dept. of Med., Div. of Gastroenterol., Denver).

Gastroenterology, vol. 55, Aug. 1968, p. 223–228. 24 refs.

Grants NIH AM 5122 and NIH AM07256.

Young rats were deprived of dietary protein for periods up to 45 days. Control rats were fed a similar synthetic diet containing 27% protein. Groups were fed *ad libitum* in one experiment and force fed in a second experiment. After sacrifice the small intestine was divided into segments and mucosal disaccharidase activities were determined. The body weight of the protein-deprived animals was less than that at the beginning of the study. The intestinal mucosa weight and protein concentration decreased less than the body weight. The activity of lactase, sucrase, and maltase calculated in reference to intestinal protein or wet weight did not decrease in any segment of intestine.

A68-82159

CHLOROPHYLL-PHOTOSENSITIZED OXIDATION OF HYDROQUINONE AND P-PHENYLENEDIAMINE DERIVATIVES.

Eiji Fujimori and Maria Tavla (AF Cambridge Res. Labs., Space Physics Lab., Energetics Branch, Photochem. Sect., Bedford, Mass.).

Photochemistry and Photobiology, vol. 8, Jul. 1968, p 31–45. 45 refs.

Electron spin resonance (ESR) and photovoltaic studies on light-induced one-electron transfer between chlorophyll *a* and electron donors in the absence of oxygen show: (1) the possible conversion of photoreduced chlorophyll *a* and *p*-benzosemiquinone ion radicals to their non-ionic radicals in methanol solutions of low pH; (2) the production of ESR absorption of tetrachloro *p* benzosemiquinone even in benzene, enhanced by the addition of triethylamine or methanol; and (3) the transfer of one electron from tetramethyl *p* phenylenediamine to either excited chlorophyll *a* or pheophytin *a* in methanol at pH above 3·6 but not to pheophytin

a at pH below 1·0 where its radical caution appears to accept an electron from excited pheophytin *a*. Bacteteriochlorophyll is also shown to be capable of photooxidizing hydroquinones and tetramethyl *p* phenylenediamine. The presence of oxygen enhances chlorophyll *a*-photosensitized oxidation of hydroquinone and tetrachloro-hydroquinone by one-electron transfer to oxygen and of trimethylhydroquinone probably by two-electron transfer to oxygen. A free radical from excited chlorophyll *a*-oxygen interaction is formed in these reactions, but rapidly quenched in the case of trimethylhydroquinone. This kind of free radical is not formed in pheophytin *a*. Tetramethyl *p* phenylenediamine readily undergoes chlorophyll a-photosensitized oxidation by oxygen in any pH region.

A68-82160

DEGRADATION OF THE DNA OF *ESCHERICHIA COLI* K TWELVE REC- (JC1569b) AFTER IRRADIATION WITH ULTRAVIOLET LIGHT.

Z. I. Horii and K. Suzuki (Natl. Inst. of Radiol. Sci., Dept. of Chem., Lab. of Biochem., Anagawa, Chiba City, Japan).

Photochemistry and Photobiology, vol. 8, Aug. 1968, p. 93–105. 28 refs.

Min. of Educ. supported research.

Degradation of the DNA of a rec− mutant of *Escherichia coli* K 12 (JC1569 b) induced by ultraviolet (u.v.) light was investigated. The rate of degradation was much larger by growing bacteria than by stationary cells. When growing bacteria were starved for amino acids, their DNA became resistant to irradiation. The mode of u.v.-induced degradation was investigated by comparing the time course of release from the acid-insoluble fraction of the label for two growing cultures; the one was pulse-labeled with ^{3}H-thymidine and the other was pulse-labeled and chased thereafter for 12 min. It was found that the label incorporated into the former culture begins to be lost from the acid-insoluble fraction prior to the loss of the label incorporated into the latter culture. It was concluded that breakdown of the replicating point precedes degradation of the bulk of the DNA. This result suggested that the replicating point is a sensitive site to irradiation and the u.v.-induced degradation of DNA seemed to be influenced by the state of chromosome at the time of irradiation. Experiments of centrifugation of lysed speroplasts of bacteria uniformly labeled with ^{3}H-thymidine in alkaline sucrose demonstrated that DNA of low molecular weight appeared after irradiation with only five ergs./mm.^{2}, and that the molecular weight could not be restored by post-irradiation incubation. Considering these results, an hypothesis is proposed concerning the initiation of induced degradation of the DNA of the rec−mutant.

A68-82161

NEUROLOGICAL FINDINGS DURING PROLONGED SLEEP DEPRIVATION.

Edward J. Kollar, Norman Namerow, Robert O. Pasnau, and Paul Naitoh (Calif., U., Neuropsychiat. Inst., Los Angeles).

Neurology, vol. 18, Sep. 1968, p. 836–840. 18 refs.

Four healthy young adult males were studied continuously during 205 hr. of sleep deprivation. The research design was directed especially to the evaluation of the psychotogenic potential of sleep deprivation and the possibility of neurological damage. The subjects tolerated the experience quite well. No evidence was found to support the claims of others that there is a psychosis of sleep deprivation. Neurological findings were minimal and, with the exception of the electroencephalogram (EEG), a return to predeprivation findings occurred after eight hr. of sleep. However, the EEGs taken a month later showed complete recovery. Follow-up studies show that sleep deprivation *per se* does not produce physical, neurological, or psychiatric changes which extend beyond the period of sleep deprivation.

A68-82162

STRESS RELATIONS IN SOCIALLY ISOLATED GROUPS.

Dalmas A. Taylor, Ladd Wheeler, and Irwin Altman (Naval Med. Res. Inst., Bethesda, Md.).

Journal of Personality and Social Psychology, vol. 9, Aug. 1968, p. 369–376. 21 refs.

NAS, NRC supported research.

Pairs of men were confined for eight da. under an experimentally manipulated factorial combination of mission-length expectation, stimulation, and privacy. Subjective reports of stress and anxiety reactions to the confinement situation were obtained via self-report questionnaires administered during the experience. Measures of A trait and A state and subjective stress provided a common picture of the difficulties in isolated small groups. These difficulties were further evidenced by a high abort rate (53%). Groups who expected to remain in isolation a long time but who were unable to complete the mission reported more anxiety and stress than those who expected short missions and were unsuccessful. Additionally, groups under long mission expectations who were successful reported more anxiety and stress than successful groups under short mission expectations. Finally, the austere conditions of a long mission in separate compartments with no outside contact proved to be most stressful. Short missions with or without contact with the outside world were least stressful and anxiety provoking.

A68-82163

AGE AND SHORT-TERM MEMORY CAPACITY FOR FAMILIAR AND UNFAMILIAR MATERIAL.

N. E. Wetherick (Bradford, U., Dept. of Social Sci., Great Britain).

Gerontologia, vol. 14, no. 4, 1968, p. 204–209.

The hypothesis has been advanced that short-term memory capacity may be relevant to the performance of the higher mental functions, in the sense that it may set a limit to the amount of material that can be processed at one time. It is suggested here that current measures of short-term memory (S.T.M.) capacity are not satisfactory if the object is to relate that capacity and performance of the higher mental functions, certain modifications are proposed. A measure of S.T.M. capacity incorporating these modifications were applied to five groups of ten subjects ranging in average age from 8.3 yr. to 61.8 yr., and age differences were found in memory for unfamiliar material though not in memory for familiar material. These findings are related to current ideas on the nature of the decline with age in intellectual capacity. The relationship between S.T.M. capacity and one of the higher mental functions (inductive problem solving) was put to a direct test and significant positive correlations were obtained.

A68-82164

"ENDOGENOUS" BIORHYTHMICITY REVIEWED WITH NEW EVIDENCE.

F. A. Brown, Jr. (Northwestern U., Evanston, Ill.).

Scientia, vol. 103, no. 673–674, p. 245–260. 32 refs.

Contracts ONR 1228-03 and ONR 1228-30; Grants NSF G-15008, NSF GB-469, NSF GB-3481, and NIH GM-07405.

It is demonstrated that a living system possesses a mean, geophysically dependent, annually modulated, diurnal variation in metabolism. Other evidence has indicated that a wide array of plants and animals possesses a fully comparable responsiveness to the pervasive physical environment. Since organisms held in hitherto presumed constant conditions are steadily appraised of the passage of time in terms of phase-angles in the natural cycles of their terrestrial environment, one is no longer compelled to postulate, as

most biologist have chosen to believe was necessary, that the endogenous rhythms require intraorganismic timers independently and dependably measuring the approximate durations of days, months and years. An alternative explanation is available.

A68-82165
FAILURE OF BRAIN NOREPINEPHRINE DEPLETION TO EXTINGUISH THE DAILY RHYTHM IN HEPATIC TYROSINE TRANSAMINASE ACTIVITY.
R. J. Wurtman, W. J. Shoemaker, F. Larin, and M. Zigmond (Mass. Inst. of Technol., Dept. of Nutr. and Food Sci., Cambridge).
Nature, vol. 219, Sep. 7, 1968, p. 1049–1050. 16 refs.
NASA and NIH supported research.

The importance of brain norepinephrine in mediating the daily rhythmic changes in the activity of tyrosine transaminase was investigated in rats. The data indicated that the daily rhythm in hepatic tyrosine transaminase activity is unrelated to the concentration of brain norepinephrine and is independent of the adrenal corticosterone rhythm. A relationship between the adrenal rhythm and the activity of central noradrenergic neurons was suggested. A persistent rise in tyrosine transaminase activity following treatment with reserpine was demonstrated.

A68-82166
DISTANCE PERCEPTION AS A FUNCTION OF AVAILABLE VISUAL CUES.
Teodor Künnapas (Stockholm, U., Sweden).
Journal of Experimental Psychology, vol. 77, Aug. 1968, p. 523–529. 7 refs.
Swed. Council for Social Sci. Res. supported research.

Four reduced-cue conditions and one full-cue condition were used to investigate distance perception as a function of available perceptual cues. It was found: (a) that accommodation does not permit any accurate perception of distance, not even at distances of one or two meters; (b) that retinal-image size is one of the most important cues for the judgment of distances; (c) that with successive increase of the number of perceptual cues, the range and the discrimination of perceived distances increase and improve in accuracy; and (d) that with successive increase of numbers of cues the certainty of the judgment increases.

A68-82167
DETECTION OF RATE OF CHANGE OF AUDITORY FREQUENCY.
Irwin Pollack (Mich., U., Mental Health Res. Inst., Ann Arbor).
Journal of Experimental Psychology, vol. 77, Aug. 1968, p. 535–541. 21 refs.
Grant NSF 2894.

Thresholds for the detection of the direction and the rate of frequency change for pure tones were determined. With constant initial frequencies of 125 to 1,000 Hz. for durations of .5-4 sec., the threshold frequency difference for detection of direction of frequency change closely approached that obtained in a conventional frequency discrimination test. The threshold rate of frequency change was inversely proportional to the duration of the frequency change. Tests with a variable starting frequency suggest that listeners can respond directly to frequency changes over the duration of the swept frequency tone. Tests with a relatively pure measure of rate of frequency change suggest that, at extremely short transition times, sensitivity to change in the rate of transition is nearly directly proportional to the frequency range subtended; at long transition times, sensitivity to change in the rate of transition is nearly independent of the frequency range subtended.

A68-82168
EFFECTS OF INTRASERIAL REPETITION ON SHORT-TERM RECOGNITION AND RECALL.
Thomas M. Wolf and John C. Jahnke (Miami U., Coral Gables, Fla.).
Journal of Experimental Psychology, vol. 77, Aug. 1968, p. 572–580. 14 refs.

The retention of seven-digit strings in which the digit in Serial Position (SP) two was repeated in either SP 4, 5, 6, or 7 was measured by recognition (Exp. I) and recall (Exp. II). Performance on repeated digits was facilitated relative to corresponding control digits in all conditions of Exp. I. Performance on repeated digits was inhibited (the Ranschburg phenomenon) in all experimental conditions of Exp. II but that one in which the repeated items were most closely adjacent. An attempt was made to explain the apparently contradictory findings of the present experiments in terms of differences between the processes of recognition and recall.

A68-82169
EFFECTIVENESS OF RETRIEVAL CUES IN MEMORY FOR WORDS.
Endel Tulving and Shirley Osler (Toronto, U., Canada).
Journal of Experimental Psychology, vol. 77, Aug. 1968, p. 593–601. 15 refs.
Grants NSF GB-3710 and NRC APT-39.

Subjects had to memorize lists of 24 to-be-remembered (TBR) words. The TBR words were exposed for a study on a single input trial, in presence or absence of cue words—weak associates of the TBR words. Recall of TBR words was tested in presence or absence of these cue words. The findings showed that (a) cue words (retrieval cues) facilitated recall of TBR words when they were present both at input and output, (b) retrieval cues did not enhance recall of TBR words when they were present only at output, and (c) two retrieval cues presented simultaneously with each TBR word were no more effective in facilitating recall than single cues. The main conclusion was that specific retrieval cues facilitate recall if and only if the information about them and about their relation to the TBR words is stored at the same time as the information about the membership of the TBR words in a given list.

A68-82170
FLICKER THRESHOLD SHIFTS AS A FUNCTION OF FREQUENCY OF INTERPOSED STIMULATION: THE LOCAL ADAPTATION PHENOMENON.
Arthur Vega, J. Paul Costiloe, and Oscar A. Parsons (Okla., U., Med. Center, Oklahoma City).
Journal of Experimental Psychology, vol. 77, Aug. 1968, p. 609–612. 12 refs.
Grant PHS NB-05359.

The impairment of critical flicker frequency (CFF) following stimulation by a flickering light has been termed local adaptation, the underlying mechanisms remaining as yet unclear. The present study investigates the relation of the adaptation effect to the absolute frequency of the adaptation stimulation. Ten normal subjects were presented ten frequencies of a flashing light, ranging five to 50 c.p.s. Each presentation was preceded and followed by a CFF determination. Degree of local adaptation or shift was determined by subtracting the poststimulation threshold from the prestimulation measure. Results indicated by a highly significant treatment effect, of inverted U shape, with a peak effect at 25 c.p.s. The results appear to illustrate the retinal component of the local adaptation phenomenon.

A68-82171
MEMORY PROCESSES AND THE SERIAL POSITION CURVE.
Norman R. Ellis and Randi Hope (Ala., U., University).
Journal of Experimental Psychology, vol. 77, Aug. 1968, p. 613–619. 11 refs
Grant PHS MH 10724.

Four experiments are reported testing the hypothesis of two storage processes in recall. In three experiments, subjects were presented a series of nine numbers in a probe-type task at differing rates. As expected, rate (item duration or interitem interval) affected the primacy and middle portions of the curve and not recency. Lower rate presumably facilitated learning and consequently long-term memory (LTM). Another experiment (using 12 letters) varied rate and also interpolated a zero-sec. ten-sec., or ten-sec. filled delay between presentation and the probe. Delays attenuated recency (a short-term memory, STM, effect), filled more than unfilled. Unfilled delay elevated primacy and middle portions when rate was fast, but in no other instance. These results were viewed as compatible with the two storage hypothesis. Strong evidence for the role of rehearsal in this task was found.

A68-82172
INDIVIDUAL VARIATIONS IN TIME JUDGMENT AND THE CONCEPT OF AN INTERNAL CLOCK.
V. R. Carlson (Natl. Inst. of Mental Health, Bethesda, Md.) and I. Feinberg (N. Y., State U., Downstate Med. Center, Brooklyn).
Journal of Experimental Psychology, vol. 77, Aug. 1968, p. 631–640. 12 refs.

Time judgments of 1 to 10 sec. by the methods of estimation, production, and reproduction were obtained from 20 normal subjects and 54 schizophrenic patients. The latter were classified into two groups, depending upon whether individual responses met a criterion for significance of regression upon the given time values. Slopes of the Response x Time Functions for subjects exhibiting significant regressions conformed to expectations of consistency among the methods based upon an internal-clock analogy. Individual mean responses for subjects failing to meet the criterion for significance of regression were highly reliable and highly correlated with the intercepts of the functions, indicating that level of response is not necessarily a valid measure of time judgment.

A68-82173
DELAYED RECOGNITION AND THE SERIAL ORGANIZATION OF SHORT-TERM MEMORY.
John C. Jahnke (Miami U., Coral Gables, Fla.) and Dwight E. Erlick (Aerospace Med. Res. Labs., Wright-Patterson AFB, Ohio).
Journal of Experimental Psychology, vol. 77, Aug. 1968, p. 641–647. 16 refs
Contract AF 33(615)-2224.

A probe-stimulus technique was used to measure the recognition of seven-digit strings after delays of 4,8, or 12 sec. Operating characteristics showed that retention was poorer at longer delays and for items from the middle of the string. Recognition rates (d) appeared to drop most rapidly for terminal items as delay increased, in agreement with analogous results obtained with recall procedures. However, the effects of recency were always greater than those of primacy and the form of the serial-position curve was essentially unchanged by increasing delay, in contrast to analogous results obtained with recall procedures.

A68-82174
EFFECT OF INSTRUCTIONAL SET ON KINESTHETIC FIGURAL AFTEREFFECTS.
Michael Wertheimer and Charles a Sheets, Jr. (Colo., U., Bolder and Denver).
Journal of Experimental Psychology, vol. 77, Aug. 1968, p. 692–695. 10 refs

A kinesthetic figural aftereffect (KFAE) was measured on two groups of ten subjects each, one group receiving instructions designed to produce a phenomenological set and the other receiving instructions designed to produce a physicalistic set. Presentation of the Müller-Lyer illusion under both types of instructions was used to indicate to the subject what was meant by the differing instructions. With the phenomenological instructions, the measured size of KFAE was significantly greater (more than twice as great) as with the physicalistic instructions, but with the physicalistic instructions the size of KFAE was still significantly greater than 0. Similar effects were obtained with the Müller–Lyer.

A68-82175
ASSEMBLY AND INSPECTION OF MICROELECTRONIC SYSTEMS.
Kenneth S. Teel, Robert M. Springer, and Ernest E. Sadler (North Am. Rockwell Corp., Autonetics Div., Anaheim, Calif.).
Human Factors, vol. 10, Jun. 1968, p. 217–223.

Two experiments were performed to determine how human performance in the assembly and inspection of microelectronic devices might be improved. The first revealed that use of tools specifically designed to minimize the probability of human error resulted in significant reductions in errors in the handling of silicon wafers. The second indicated that providing the operator with a visual frame of reference resulted in detection of a significantly greater percentage of the defects present in photo masks of the type used in production of microelectronic circuits.

A68-82176
USER INPUT MODE AND COMPUTER-AIDED INSTRUCTION.
Charles S. Morrill, Nancy C. Goodwin, and Sidney L. Smith (MITRE Corp., Bedford, Mass.).
Human Factors, vol. 10, Jun. 1968, p. 225–232. 9 refs
Contract AF-19(628)5165.

An evaluation of on-line computer-aided instruction within a management information system compared typewriter and lightpen input modes as students learned to use the system. The following conclusions were supported: (1) computer-aided instruction is feasible in a general-purpose management information system; (2) it is also feasible to demonstrate retention of learned material through computer-administered tests; (3) professional typing skills are not necessary to use the typewriter input mode effectively, provided that the inputs required are short and direct; (4) in this particular setting there seemed to be evidence that the typerwriter was a more effective input device than the lightpen during the instructional sequence, but this evidence is questionable in view of considerable differences among the students; and (5) regardless of performance, students responded favorably to their experience with computer-aided instruction.

A68-82177
SPECIFICATION OF ROAD TRAFFIC SIGNAL LIGHT INTENSITY.
Barry L. Cole and Brian Brown (Melbourne, U., Victorian Coll. of Optometry, Australia).
Human Factors, vol. 10, Jun. 1968, p. 245–254. 18 refs.
Australian Road Res. Board supported research.

In a previous communication data were reported supporting the recommendation that a red road traffic signal should have an intensity of 200 cd. for optimum recognition from 100 m. when

the signal is seen against a very bright sky (10^4 cd./m^2.). This confirmed the earlier results of Boisson and Pages. The present paper extends the data to include: (a) the effect of signal size on optimum signal intensity for a practical range of angular diameters (4.1 to 16.5 min. of arc); and (b) the effect of background luminance for a range of luminances of 1.5 ft-L. to 2,250 ft-L. The resuts show that optimum signal intensity is independent of signal size and that spatial summation by the visual system is complete. However the same data demonstrate a failure of spatial summation when a conventional threshold criterion (probability of seeing the signal 0.5) is used. It is shown that smaller signals will be more effective than larger ones of the same intensity if their intensity is less than optimum. Optimum signal intensity is shown to be a linear function of background luminances greater than 10 ft-L. A graph relating optimum signal intensity to signalling range for various background luminances summarises the experimental data.

A68-82178
DRIVING AT REQUESTED SPEED: COMPARISON OF PROJECTED AND VIRTUAL IMAGE DISPLAYS.
Gerald V. Barrett (Goodyear Aerospace Corp., Akron, Ohio), Minoru Kobayashi, and Bernard H. Fox.
Human Factors, vol. 10, Jun. 1968, p. 259–262. 6 refs.
Contract PHS PH-108-64-168.

Using projected image and virtual image displays in a driving simulator, a study was completed on drivers' ability to drive at five experimenter-requested speeds. No differences were found between the two display techniques. However, the use of both displays resulted in speed over-estimation above 30 m.p.h.

A68-82179
SINGLE AND DUAL AXIS TRACKING AS A FUNCTION OF SYSTEM DYNAMICS.
Peter N. Ziegler (Natl. Highway Safety Bur., Washington, D. C.).
Human Factors, vol. 10, Jun. 1968, p. 273–275. 6 refs.

Single axis manual tracking was compared to dual axis tracking for zero, first, second and third order dynamics. Tracking error on the original axis was significantly degraded for first, second and third order dynamics with no difference occurring for zero order. The results seem to indicate that the operator's information handling capacity becomes overloaded as the system order increases resulting in a decrement of performance.

A68-82180
PILOT RESPONSE IN COMBINED CONTROL TASKS.
Hugh P. Bergeron (NASA, Langley Res. Center, Langley Sta., Hampton, Va.).
Human Factors, vol. 10, Jun. 1968, p. 277–282

Pilot response in a multi-task simulation, which consisted of a primary control task combined with one or two secondary or side control tasks, was investigated. A general description of the response characteristics of each of these tasks was obtained and this information was used to determine the work-load requirements of the tasks. Two different control tasks were used as the primary control task, either a fixed-base simulation of a lunar letdown or a simplified multi-loop tracking task which was similar to the end portion of the lunar letdown. The simplified tracking task was used in lieu of the more complicated lunar letdown because it would be represented and reproduced analytically. The secondary or side tasks consisted of a system failures task and a motor response task. The system failures task was incorporated from those systems present in a vehicle known as the Mercury Procedures Trainer. The task consisted of using a pencil-like device to make impacts on two separate, restricted columns. An evaluation of the pilot's capability in controlling the multi-task simulation and a determination of the inter-task correlation was made. It is shown that either of the two side tasks produced similar effects on the primary task. Quality measurements were made of all three tasks in all possible combinations. The degradation of each, when in the combined task tests, was then correlated to the other task(s) of the same test. A simple relationship was found by which one could predict the time required of a human operator to perform the particular task(s) in question. This relationship could be used to determine the workloading qualities of the tasks when performed either alone or combined. An analytical representation for the degraded pilot response in the multi-loop tracking task was also obtained.

A68-82181
STUDIES OF COMPONENT-TOTAL TASK RELATIONS: ORDER OF COMPONENT-TOTAL TASK PRACTICE AND TOTAL TASK PREDICTABILITY.
Roy Omer Freedle, Albert Zavala, and Edwin A. Fleishman (Am. Inst. for Res., Washington, D. C.).
Human Factors, vol. 10, Jun. 1968 p. 283–296. 9 refs.
Contract DA-49-193-MD-2632.

The Complex Coordination Test was used to examine component-total task relationships when component tasks were practiced in different orders. Sixty subjects practiced (two trials of two min. each) on six component tasks and on the total task, practicing these in various orders. Part-tasks were three single-level (one rudder and two stick control) tasks and three double-level (one stick-stick and two rudder-stick) tasks. Correlational analyses were performed to determine component-total task relationships and component to total task predictability. It was found that order of part-task practice affects total task proficiency. Also part-task scores can be combined in a statistically independent manner to yield prediction scores on a more complex task only when a specific double-level task is combined with a specific single-level task. It was also found that observed and predicted total task scores agree better when double-level tasks are practiced before rather than after the total task. Finally, prior practice on double-level tasks led to better total task proficiency than did prior practice on single-level tasks.

A68-82182
ULTRASTRUCTURE OF THE ORGAN OF CORTI.
Catherine A. Smith (Washington U., School of Med., St. Louis, Mo.).
Advancement of Science, vol. 24, June. 1968, p. 419–433. 35 refs.
Grant NIH N.B.00966.

The current knowledge about the general cytological structure of the organ of Corti and its innervation pattern was summarized. Two special structures seem to be present in all cochlear and vestibular hair cells in vertebrates, i.e. the cilia and the cuticular plate. The cilia are always in contact with a movable accessory structure such as tectorial membrane or cupula, and sensory nerve endings are always attached to the more basal part of the cell. The pathways of cochlear and efferent nerve fibers within the organ of Corti were diagramed.

A68-82183
VISUAL ACUITY DURING SPACE FLIGHTS.
Jerry W. Logan (Ind. U., Div. of Optometry, Bloomington).
Optical Journal and Review of Optometry, vol. 105, Aug. 15, 1968, p. 31–40. 20 refs.

The question of a change in visual acuity during flight in outer space is reviewed and analyzed. The effects of acceleration, motion, vibration, weightlessness, posture, space cabin environment and psychological stress on acuity are discussed. The effects of

these factors are difficult to evaluate. One analysis of the subjective observations of the astronauts during space flights is presented. The possibility of seeing objects reported by the astronauts is argued. Visual acuity tests performed in space are discussed. It is concluded that visual acuity does not appreciably change while in space.

A68-82184
THE QUANTUM REQUIREMENT OF PHOTOSYNTHESIS IN CHLORELLA.
Kam-sik Ng and J. A. Bassham (Calif., U., Lawrence Radiation Lab., Chem. Biodyn. Lab., Berkeley).
Biochimica et Biophysica Acta, vol. 162, Aug. 20, 1968, p. 254–264. 13 refs.

The quantum requirement of photosynthesis in *Chlorella pyrenoidosa* has been reinvestigated. Evolution of oxygen was measured electronically with an instrument which determines the paramagnetism of the gas mixture and carbon dioxide was measured by its infrared absorption. Light measurements were made with a photocell calibrated against a thermopile, using filtered sunlight as a reference beam. Consideration of possible sources of error established the reliability of quantum requirement determinations as ±6%. Determinations were made only with cultures which exhibited photosynthetic rates exceeding 250 μmoles O_2 evolved per mg. chlorophyll per hr. In 16 determinations made over a two-fold range of photosynthetic rates, quantum requirements for O_2 varied from 8.8 to 12.4. No correction for respiration was made, and a rationale is given for not making such corrections. Quantum requirements were independent of rate of light absorption over the 2.5-fold range used in this study. A probable cause of error was discovered in previously reported quantum requirements less than eight determined by a similar method. The measured requirements are consistent with a serial two-light reaction scheme for photoelectron transport and an additional biosynthetic requirement for ATP, generated in part by cyclic photophosphorylation.

A68-82185
ELECTROMYOGRAPHY AND CINEMATOGRAPHY OF LEG AND FOOT ("NORMAL" AND FLAT) DURING WALKING.
Edwin G. Gray and John V. Basmajian (Queen's U., Dept. of Anat., Kingston, Ontario, Canada).
Anatomical Record, vol. 161, May 1968, p. 1–15. 48 refs.

Electromyography with fine-wire electrodes and special equipment for synchronized motion pictures were used to study six muscles of the leg and foot during walking in five different ways in ten normal and ten flatfooted subjects. Detailed analyses and comparisons of the two groups are described and discussed. *Tibialis anterior* has two peaks of activity at heel-strike and toe-off of the stance phase; is inactive during mid-swing and middle of the stance phase; is active at full-foot in flatfooted subjects, and generally more active during toe-out and toe-in walking. *Tibialis posterior* is inactive through the swing phase. In flatfooted persons it becomes activated at heel-strike and more active at full-foot during level walking. The toe-out position reduces its activity. *Flexor hallucis longus* is most active in mid-stance; during toe-out walking, activity increases in both phases, generally being more active in normal persons. *Peroneus longus* is most active at mid-stance and heel-off and generally more active in flatfooted persons. *Abductor hallucis* and *Flexor digitorum brevis* are generally more active in flatfooted persons. An important regular pattern of inversion and eversion during the walking cycle is described. Contingent arch support by muscles rather than continuous support is the rule, muscles being recruited to compensate for lax ligaments and special stresses during the walking cycle.

A68-82186
INSULIN TIME VERSUS GREENWICH TIME: SOLVING THE PROBLEMS OF JET TRAVEL.
Helen K. Carney.
American Association of Industrial Nurses Journal, vol. 16, Aug. 1968, p. 10–11.

The problem of regulating food intake in diabetics with insulin intake when confronted with time changes due to jet travel is discussed. A personal experience is related illustrating that the insulin-time of diabetics is of biological importance to the individual, and adjustment to regular time is difficult.

A68-82187
A PSYCHOPATHOLOGICAL REACTION PRECIPITATED BY SENSORY DEPRIVATION.
George C. Curtis (Eastern Pa. Psychiat. Inst. and Pa., U., School of Med., Philadelphia) and Marvin Zuckerman (Albert Einstein Med. Center, Philadelphia, Pa.).
American Journal of Psychiatry, vol. 125, Aug. 1968, p. 255–260. 15 refs.
Grant PHS MH-07926.

A young male subject developed an acute psychotic reaction during an eight hr. sensory deprivation experiment. His delusions lasted several days, and severe anxiety and depression lasted several weeks. This is the third reported case of such a prolonged reaction.

A68-82188
CYCLIZINE TOXICITY—INTENTIONAL DRUG ABUSE OF A PROPRIETARY ANTIHISTAMINE.
Peter H. Gott (Sharon Hosp., Conn.).
New England Journal of Medicine, vol. 279, Sep. 12, 1968, p. 596. 5 refs

Case histories of three young men with cyclizine intoxication were presented. The patients took massive overdoses of the supposedly non-toxic proprietary antihistamine. Their signs and symptoms were similar to those recently described in cases of diphenhydramine and stramonium poisoning.

A68-82189
BINOCULAR RIVALRY AND VISUAL EVOKED RESPONSES.
Ted Lawwill and William R. Biersdorf (Walter Reed Army Med. Center, Walter Reed Army Inst. of Res., Div. of Neuropsychiat., Washington, D. C.).
Investigative Ophthalmology, vol. 7, Aug. 1968, p. 378–385. 9 refs.

A subject viewed a different grating target with each eye in a binocular rivalry situation and continuously indicated with a response key which target he was seeing. Each target was illuminated with flickering light at different frequencies superimposed upon a steady background. The evoked cortical responses were tape-recorded and later analyzed by average response computer separately for each eye, seeing and not seeing. Differences in latency and amplitude of the evoked responses were found in comparing the dominant and suppressed conditions of the same eye.

A68-82190
THE ACTIVITY OF SOME HYDROLYTIC ENZYMES IN EXPERIMENTAL HYPOXIA OF THE BRAIN.
M. Kozik (Med. Acad., Dept. of Neurol., Poznań, Poland).
Folia Histochemica et Cytochemica, vol. 6, no. 2, 1968, p. 297–310. 16 refs.

Investigations were carried out on 36 sexually mature male and female rats to study the influence of hypoxia of the central nervous system on the state of activity of some hydrolytic enzymes. The rats were segregated into groups one of which was subjected to the action of an oxygen-deficient gas mixture (3% O_2–97% N_2) preceded by ligature of the internal carotid artery. The second group was exposed to hypoxia without ligature of the mentioned artery. To the third group ligature was applied without exposure to hypoxia. After the conclusion of the experiment, the animals were killed at various intervals and the brain was sampled for histochemical examination. It was found that a single hypoxia prolonged up to cessation of respiration fails to evoke morphological changes in the neurocytes or any effect upon the level and localization of the activity of phosphatases and esterases. Ligature of the internal carotid artery in unaltered respiratory conditions involves no enzymatic or morphological changes in the brain. However, brain hypoxia preceded by ligature of the artery involves distinct morphological and histochemical changes in the neurocytes within ten hr.

A68-82191
DEFICITS IN RETENTION AND IMPAIRMENTS IN LEARNING INDUCED BY SEVERE HYPOTHERMIA IN MICE.
Ralph E. Beitel and Paul B. Porter (Utah, U., Salt Lake City).
Journal of Comparative and Physiological Psychology, vol. 66, Aug. 1968, p. 53–59. 11 refs.
Grant PHS MH-15,950.

Effects of whole-body immersion hypothermia on retention and learning were tested in mice. In Experiment 1, one-trial passive avoidance was followed by hypothermia at intervals of .5, 5, or 20 min. A test trial 24 hr. later found short-term retention deficits in mice cooled to 2°C. following training-immersion intervals of .5 or 5 min. In Experiment 2, hypothermia to 2°C. by immersion for 15 or 30 min. was followed by training trials or retention trials on a simple black-white discrimination. Immersion for 15 min. had a transitory effect on acquisition, but acquisition and long-term retention were impaired in groups cooled for 30 min.

A68-82192
STIMULUS CONTROL, CUE UTILIZATION, AND ATTENTION: EFFECTS OF DISCRIMINATION TRAINING.
Frederick L. Newman and Robert L. Benefield (N. Mex. State U., Las Cruces).
Journal of Comparative and Physiological Psychology, vol. 66, Aug. 1968, p. 101–104. 8 refs.
N. Mex. State U. and Claude Dove Res. Fund supported research.

To test a hypothesis concerning cue utilization and attention, 48 pigeons were run in a study of effects of differential training on stimulus control. A secondary reinforcement training procedure controlled response-rate differences between differentially (D) and nondifferentially (ND) trained subjects; a Guttman–Kalish testing procedure was used. S^r+ was a white vertical line on a green surround; S^r- was the green surround alone. While both D and ND subjects produced identically steep gradients for line orientation varied on an achromatic surround, D subjects produced a markedly steeper gradient with the green surround. For a third group S^r+ and S^r- were reversed from the D group and inhibitory gradients were not obtained for either test surround.

A68-82193
THE CAPACITY FOR ENDURANCE WORK IN HIGHLY TRAINED MEN.
C. G. Williams, A. J. N. Du Raan, M. J. von Rahden, and C. H. Wyndham (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab., Johannesburg, South Africa).
Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jul. 29, 1968, p. 141–149. 19 refs.

Twenty-three Bantu male subjects were studied at various levels of work on a bicycle ergometer in order to establish the level of oxygen consumption, as a percentage of their maxima, at which lactate and excess lactate started to increase in the blood. Well trained men can work for short periods of six min. at 62% of the maximum oxygen intake without increases in blood lactate. For prolonged work of one hr. the value was 68% of the maximum oxygen intake. It was concluded that with acute work the duration of exercise was too short for a steady state to have been attained by either blood lactate or pyruvate. The effect of high and low ambient temperatures on anaerobic metabolism was discussed. The results were also discussed in context with findings of previous studies.

A68-82194
FAILURE OF HYPOXIA TO PRODUCE RETOGRADE AMNESIA.
J. M. Vacher, R. A. King, and A. T. Miller, Jr. (N. C., U., Chapel Hill).
Journal of Comparative and Physiological Psychology, vol. 66, Aug. 1968, p. 179–181. 9 refs.
U.S. Army Res. and Develop. Command supported research.

In one experiment with rats, hypoxia produced no significant retrograde amnesia in a one trial passive-avoidance task. In a second experiment, hypoxia was found to produce no retrograde amnesia of a previously learned form discrimination. It was postulated that the failure of hypoxia to produce retrograde amnesia may be due to inability to produce intracellular hypoxia of brain cells with sufficient rapidity to interfere with consolidation processes.

A68-82195
AVOIDANCE AND FREEZING BEHAVIOR FOLLOWING DAMAGE TO THE HIPPOCAMPUS OR FORNIX.
Phillip Liss (Mass. Inst. of Technol., Cambridge).
Journal of Comparative and Physiological Psychology, vol. 66, Aug. 1968, p. 193–197. 9 refs.
NASA Grant NsG 496.

Rats with partial lesions of the hippocampus or fornix were not deficient in either one-way active avoidance or passive avoidance (punished active avoidance) when trials were massed. Deficits in both tasks appeared when trials were distributed. These results confirm previous findings, but a memory interpretation of them seems incorrect. Shuttle-box learning was considerably facilitated by lesions and correlated negatively with passive avoidance learning under distributed trails. A decreasing freezing interpretation was rejected since a direct measure of freezing behavior while the subject was in the safe area revealed no significant differences between groups on any avoidance task and showed that visible relaxation in the safe area was not a precondition for avoidance learning.

A68-82196
VARYING SPATIAL SEPARATION OF CUES, RESPONSE, AND REWARD IN VISUAL DISCRIMINATION LEARNING IN MONKEYS.
Alan Cowey and Lawrence Weiskrantz (Cambridge, U., Great Britain).
Journal of Comparative and Physiological Psychology, vol. 66, Aug. 1968, p. 220–224. 8 refs.
Contract AF 61(052)-185 and Grants PHS NB-04800-02 and MRC G. 965/96/B.

The experiment compared the effects of cue-response and cue-reward spatial separation on the acquisition of a visual pattern discrimination in 39 rhesus monkeys. Performance scores for subjects with one or other type of separation did not differ

significantly, although both groups needed significantly more trials and made more errors than controls, for whom cue, response, and reward were spatially contiguous. The order in which the response and reward sites were uncovered on each trial by a rising screen proved to be a significant and hitherto unreported variable; subjects needed fewer trials when the stimuli were the first rather than the last part of the testing display to be revealed.

A68-82197
LYSINE REQUIREMENT OF THE GROWING GNOTOBIOTIC MOUSE.
G. S. Stoewsand (Cornell U., N. Y. S. Agr. Experiment Sta., Dept. of Food Sci. and Technol., Geneva, N. Y.), H. A. Dymsza (R. I., U., Dept. of Foods and Nutr., Kingston), D. Ament, and P. C. Trexler (Roy. Vet. Coll., Dept. of Pathol., London, Great Britain).
Life Sciences, vol. 7, part 2, Jul. 15, 1968, p. 689–697. 14 refs.

The lysine requirement of the growing gnotobiotic mouse, i.e., germfree mice established with intestinal microflora from a human source, a wild mouse source, or a combination of five selected intestinal bacterial cultures was investigated. Maximal growth rate occurred when germfree mice, or mice inoculated with the human or selected cultures were fed an amino acid diet containing 0.4% lysine. Mice inoculated with the wild mouse flora had equivalent growth at the 0.6% lysine level. This group, irrespective of diet fed, had marked decreases in staphylococci, anaerobic bacteroides, and coliforms in the feces.

A68-82198
THE EFFECT OF STARVATION ON GLYCOGEN SYNTHETASE ACTIVITY IN THE HEART AND SKELETAL MUSCLE OF THE RAT.
Julius Belford and Marjorie A. Cunningham (N. Y., State U., Downstate Med. Center, Brooklyn).
Life Sciences, vol. 7, part 2, Jul. 15, 1968, p. 747–750. 8 refs.
Grant NHI HE 09580.

Eighteen, 48 and 96 hr. periods of starvation lead to a progressive, marked decline in both total and independent, active "I" form of glycogen synthetase in the rat heart. The relative percent of "I" remains unchanged until the 96th hr. at which time it, too, decreases. Skeletal muscle synthetase remains relatively unaffected during starvation.

A68-82199
VITAMIN C ALLOWANCE FOR CREWS OF SEAGOING SHIPS [C-VITAMINNAIA OBESPECHENNOST' EKIPAZHEI SUDOV DAL'NEGO PLAVANIIA].
E. P. Boiko.
Voprosy Pitaniia, no. 3, May–Jun. 1968, p. 46–52. 9 refs. In Russian.

Vitamin C allowance for crews of seagoing ships in different climatic zones in different types of vessels and under various working conditions was studied. Investigations have shown that the vitamin C supplied to the seamen is dependent upon its content in the food, climatic conditions and intensity of the physical performance. The vitamin C allowance is noted to decrease at high latitudes in the tropics and partially in central latitudes during the winter and spring. Approximate optimal vitamin C dosages for different climatic zones, along with doses of complementary vitaminization of the food consumed by the ships crews are suggested.

A68-82200
WORKING PERFORMANCE, CALORIC EXPENDITURE AND WORKING EFFICIENCY IN OLD AGE [PRACOVNI VYKONNOST, KALORICKY VYDEJ A UCINNOST PRACE VE STARI].
E. Eiselt.
Casopis Lékaru Ceských, vol. 107, May 1968, p. 585–588. 15 refs. In Czech.

In 159 men aged 60–89 yr., the working performance on a bicycle ergometer up to the point of a subjective feeling of exhaustion was assessed. The caloric expenditure and working efficiency were also studied. According to the intensity of their all-life physical training regimen the men were divided into three groups. In the seventh as well as eighth decade both groups of men formerly engaged in physical training performed significantly more work on the bicycle ergometer than those not engaged in physical training. Also the caloric output during work was significantly higher in both groups engaged in physical training. There was, however, no difference in the working efficiency which indicated how economically the working capacity of the organism was used. There was no difference between groups, and with advancing age there was no difference in individual groups. It may thus be concluded that the working efficiency does not change with advancing age.

A68-82201
PHYSICAL FITNESS IN OLD AGE. 2. ANAEROBIC CAPACITY, THE SHARE OF AEROBIC WORK IN GRADED LOADS, RECOVERY AFTER MAXIMUM WORKING PERFORMANCE IN OLD PEOPLE [TELESNA ZDATNOST VE STARI. 2. ANAEROBNI KAPACITA, PODIL ANAEROBNI PRACE PRI STUPNOVANEM ZATIZENI, ZOTAVENI PO MAXIMALNIM PRACOVNIM VYKONU U STARYCH LIDI].
L. Tlustý.
Casopis Lekaru Ceskych, vol. 107, May 1968, p. 589–594. 30 refs. In Czech.

The object of the present work was to assess, as part of investigations of physical fitness of old people, the decrease in anaerobic capacity and respective changes in the anaerobic metabolism during physical strain in relation to age. In 100 healthy people of both the sexes aged 50–90 years, examinations were made by the method of graded loads, during exercise, in addition to other parameters of physical fitness, respiratory quotient (RQ) and lactic acid blood levels were assessed. The same (RQ) determinations were made also during 25 mins. of recovery after maximum performance. The anaerobic capacity in the 6th to 8th decade in men and women declines similarly as the aerobic capacity, both declining evenly with age. According to the RQ in older subjects during submaximum loads the anaerobic metabolism sets in sooner. No significant differences were found in lactic acid levels [due to a greater scatter] with advancing age. The author found also age-conditioned differences during the recovery period after maximum physical performance, however, investigations of the problem must be approached by a different method.

A68-82202
ACCELERATION OF TURNOVER OF 14-CARBON-CATECHOLAMINES IN RAT BRAIN BY CHLORPROMAZINE.
K. F. Gey and A. Pletscher (F. Hoffman-La Roche and Co. AG, Forschungsabt., Basel, Switzerland).
Experientia, vol. 24, Apr. 15, 1968, p. 335–336. 20 refs.

Pretreatment with 10 mg/hg. chlorpromazine i.p. in rats injected with ^{12}C-tyrosine caused an increase in the specific radioactivity of ^{14}C-dopamine in the brain. Chlorpromazine expedited the decrease in dopamine and norepinephrine specific radioactivity in animals with cerebral catecholamine which was labeled with L-2-^{12}C-dopa. It was concluded that chlorpromazine accelerates the turnover of cerebral catecholamine.

A68-82203
SIGNS OF CEREBRAL HYPOXIA IN HYPERVENTILATION.
L. Granholm and B. K. Siesjö (Lund, U., Dept. of Neurosurg. and Lasarettet, Neurosurg. Serv. A, Sweden).
Experientia, vol. 24, Apr. 15, 1968, p. 337–338. 9 refs.
Contract ONR F6 1052 67C 0052 and Swed. Med. Res. Council supported research.

Passive hyperventilation in anesthetized and immobilized cats caused a significant increase in the lactate/pyruvate ratio in the cerebrospinal fluid and brain tissue. Due to the connection between the lactate/pyruvate and NADH/NAD+ systems, hyperventilation (CO_2 tension below 20 to 25 mm. Hg) was consequently assumed to cause cerebral hypoxia.

A68-82204
THE ACTIVITY OF NEURONS IN THE LATERAL GENICULATE BODY DURING WAKEFULNESS AND NATURAL SLEEP.
J. Thomas, P. Groves, and M. Verzeano (Calif., U., Dept. of Psychobiol., Irvine).
Experientia, vol. 24, Apr. 15, 1968, p. 360–362. 19 refs.
Grants NIH NB 07145 and NIH FO5 TW 1017.

Microelectrodes were implanted in the brains of seven cats in order to study the following: (1) quantitative changes which occur in thalamic neuronal activity in unrestrained, unanesthetized animals: (2) the phase of low voltage–fast wave sleep; (3) the extent of the neuronal territory within which the changes in neuronal activity occur; and (4) to develop a method of implantation of microelectrodes which is simple and does not involve the use of metallic cannulae. Results showed that as the animals passed from wakefulness to slow-wave sleep, the frequency of discharge of neurons was greatly reduced and as they passed into low voltage-fast wave sleep, the frequency of discharge was greatly enchanced. The differences in frequency of discharge between the three states was significant beyond the 0.01 level in all cases. The differences between the ratios of neuronal activity during wakefulness, low voltage-fast wave sleep and slow-wave sleep were also statistically significant beyond the 0.01 level. It was determined that in the unanesthetized, unrestrained animal the changes in neuronal activity which occur in the transition from wakefulness to the various stages of sleep, or vice versa, develop within relatively large neuronal territories and involve large numbers of neurons.

A68-82205
DAILY RHYTHM OF S32 [SIC] INCORPORATION INTO EPIPHYSEAL CARTILAGE IN MICE.
D. J. Simmons (Argonne Natl. Lab., Radiol. Physics Div., Ill.).
Experientia, vol. 24, Apr. 15, 1968, p. 363–364. 10 refs.
AEC supported research.

The daily rhythm of S^{35} incorporation into the epiphyseal cartilage of mice was studied by subjecting the animals to a 12 hr. photoperiod. The mice were injected at various times with S^{35}-sulfate, and serial sections of epiphyseal cartilage from femurs and tibias were made. It was found that the uptake of S^{35} in the growth cartilages is subject to diurnal variations.

A68-82206
EXCITATION AND INHIBITION IN COCHLEAR NUCLEUS. I. TONE-BURST STIMULATION.
G. L. Gerstein, R. A. Butler, and S. D. Erulkar (Pa., U., School of Med., Depts. of Biophysics and Physiol., Anesthesiol., and Pharmacol., Philadelphia).
Journal of Neurophysiology, vol. 31, Jul. 1968, p. 526–536. 17 refs.
Grants PHS NB-05606, PHS GM 09070, and PHS NB-02941.

Firing patterns and membrane potentials were studied in neurons of the cochlear nucleus by means of intracellular electrodes. Stimuli consisted of sequences of short tone bursts of different frequencies. Previous work has shown, for most of these neurons, that spike discharges are sustained for the duration of the tonal stimulus. It was found in this study that the sustained discharge was associated with a sustained membrane depolarization which lasted for the duration of the tonal stimulus. The sustained discharge in many cases contained interruptions that were often functions of both tonal frequency and time after stimulus onset. In some units the duration of suppression of firing either during or after a stimulus tone was linearly related to the logarithm of the stimulus frequency. Hyperpolarization of the membrane was rarely observed during suppression of firing, even in neurons where depolarization was observed during spike firing. This suggests that the inhibitory synaptic inflow, as well as a trigger zone, were placed remotely from the (presumably) somatic location of the electrode. Although no inhibitory synaptic inflow was directly observed, the lack of correlation between the firing patterns and the observed depolarizations suggests that the time courses of the inhibitory and excitatory processes are different. The modulation of firing patterns by inhibition plays an important role in stimulus coding at the cochlear nucleus.

A68-82207
EXCITATION AND INHIBITION IN COCHLEAR NUCLEUS. II. FREQUENCY-MODULATED TONES.
S. D. Erulkar, R. A. Butler, and G. L. Gerstein (Pa., U., School of Med., Depts. of Pharmacol, Anesthesiol., and Biophysics and Physiol., Philadelphia).
Journal of Neurophysiology, vol. 31, Jul. 1968, p. 537–548. 17 refs.
Grants PHS NB-02941, PHS GM 09070, and PHS NB-05606.

Extracellular and intracellular recordings were made from neurons of the cochlear nucleus during presentation of frequency-modulated tonal stimulus. Firing patterns of most of these neurons in response to slow frequency modulation of the stimulus may be predicted from their responses to tone bursts of fixed frequency. This type of prediction is rarely possible at higher levels of the auditory system. Three different types of firing pattern were found in response to slow frequency modulation of the stimulus. These firing patterns may be classified according to their symmetry with regard to rising or falling tones. They may be interpreted in terms of different arrangements of synaptic endings on the neuron under study. At higher rates of frequency modulation the firing patterns are influenced both by df/dt and by the repetition rate. The effect of df/dt was examined by means of trapezoidal modulation of frequency. As shown also in the companion paper, there is often only weak correlation between membrane potentials and firing patterns. Several methods are shown for examining the response of the membrane potential in relation to different portions of the stimulus cycle.

A68-82208
OLIVOCOCHLEAR BUNDLE STIMULATION: EFFECTS ON SPONTANEOUS AND TONE-EVOKED ACTIVITIES OF SINGLE UNITS IN CAT COCHLEAR NUCLEUS.
A. Starr and J. S. Wernick (Stanford Med. School, Dept. of Neurol., Palo Alto, Calif.).
Journal of Neurophysiology, vol. 31, Jul. 1968, p. 549–564. 23 refs.
Grants NINDB NB 05700 and NINDB NB 31242.

These experiments examined the effects of stimulating the olivocochlear bundle (OCB) at its point of decussation in the floor of the IVth ventricle on both spontaneous and tone-evoked activities in 121 single units in cochlear nucleus of unanesthetized,

decerebrate cats. Spontaneous discharge rates were unaffected in 51% of the units, decreased in 31%, and increased in 18%. The effects on spontaneous activity persisted beyond the period of OCB stimulation and were often followed by rebound aftereffects. OCB stimulation did not affect tone-evoked responses in 18% of the units, decreased response rate in 37% of the units, and increased response rate in 23%. In the remaining 22% of the units OCB stimulation had complex effects on tone-evoked responses, causing a decrease in activity evoked by tones near threshold intensity and an increase in activity to tones of higher intensity. The occurrence of these different effects could be correlated with the units' intensity function (monotonic or nonmonotonic), presence of an inhibitory surround, and the changes in spontaneous activity induced by OCB stimulation. There was little correlation of OCB effects with the location of the unit in cochlear nucleus complex or with the unit's best frequency. OCB stimulation was still effective in modifying spontaneous activity in cochlear nucleus units after destruction of the cochlea ipsilateral to the recording site. This finding suggests that OCB has a direct effect on cochlear nucleus.

A68-82209
RAPID RESISTANCE SHIFTS IN CAT CORTEX DURING CLICK-EVOKED RESPONSES.

Kenneth A. Klivington, and Robert Galambos (Yale U., Dept. of Psychol. and Dept. of Eng. and Appl. Sci., New Haven, Conn.).

Journal of Neurophysiology, vol. 31, Jul. 1968, p. 565–573. 32 refs.

NASA Grant NSG 374 and NASA Grant GM 1106.

A resistance shift—decrease followed by increase—accompanies the electrical activity evoked from the cortex of anesthetized cats by click and flash stimulation. The evoked resistance shift (ERS) and the evoked potential (EP) have similar spatial distributions on the cortical surface and its depths. Their latency, waveshape, and time course may also be closely similar. The ERS, however, attains its maximum amplitude at a depth of about 1.0 mm. and retains its waveshape regardless of alterations in EP waveshape produced during electrode penetration of the cortex. Trauma, anesthetic level, and temperature change differentially influence the amplitude of EP and ERS, with the ERS in every case being more sensitive to such manipulations. It is suggested that the arrival of nerve impulses originated by click or flash stimulation not only initiates events yielding the EP but, in addition, activates some process yielding the ERS. Possibilities for what this additional process may be included changes in the volume or composition of extracellular fluid associated with altered permeability of neuronal membranes.

A68-82210
NONLINEAR ANALYSIS OF ELECTRORETINOGRAPHIC B WAVE IN MAN.

A. Troelstra and N. M. J. Schweitzer (Natl. Defense Res. Organ., Inst. for Perception RVO-TNO, Soesterberg, The Netherlands).

Journal of Neurophysiology, vol. 31, Jul. 1968, p. 588–606. 36 refs.

Grants NSF GK 885 and NIH NB 06197.

A nonlinear model was developed to describe the relation between light stimulus and the electroretinographic B wave. In this model the light stimulus I(t) is multiplied by a sensitivity function S, which depends on the past history of the eye. The parameters of the model can be determined from some simple experiments in the time domain, such as double-flash experiments and experiments where the B-wave response of the dark-adapted eye is measured for various values of the stimulus energy. A good description could be given of the amplitude of the B wave as a function of the stimulus duration, the step-function response, the response to short flashes with low and high repetition frequencies (Talbot's law), the response to sinusoidal stimulation (amplitude and phase characteristics), and the distortion of the B wave in case the eye is light-adapted. The important conclusion is that all these phenomena are strongly interrelated, and that this interrelationship can be understood qualitatively and quantitatively on the basis of an elementary model. Since the model is based on input/output data only, the question remains how the model parameters are related to retinal physiology. Some speculations regarding this relationship were made. To gain more insight about this matter, additional experiments must be designed to correlate the model parameters with possible physiological or pathological variables. However, the model could very well aid in the selection of those experiments which yield a maximum amount of information from a minimum amount of experimentation.

A68-82211
DEVELOPMENT OF VISUALLY EVOKED POTENTIALS IN KITTENS: SPECIFIC AND NONSPECIFIC RESPONSES.

Guenter H. Rose and Donald B. Lindsley (Calif., U., Brain Res. Inst. and Depts. of Psychol. and Physiol., Los Angeles).

Journal of Neurophysiology, vol. 31, Jul. 1968, p. 607–623. 21 refs.

Contracts Nonr 233(32) and Nonr 4756-03.

The development of electrocortical evoked responses to light flash stimuli was studied in kittens as a function of age, by the use of both cross-sectional and longitudinal methods. Periodic recordings were made in the same kitten over a span of ages ranging from 4 to 56 days. Kittens were either lightly anesthetized for recording sessions or were unanesthetized and had implanted electrodes. Two separate and independent responses were identified on the basis of age of onset, polarity, latency, amplitude, cortical distribution, and their differential reactions to selective lesions. The characteristics of one of these responses, a long-latency negative wave, together with its distribution over nonvisual areas suggested its dependence on a nonspecific visual system. The nature of the other, a shorter latency response, suggested a specific visual system. It was hypothesized that the former is mediated by optic pathways to the tectum, and the latter by geniculostriate projections. The results are interpreted as confirming the hypothesis. Lesions of the superior colliculus, pretectum, and brachium of the superior colliculus abolished or markedly reduced the long-latency nonspecfic negative wave of early age of onset, but did not affect the short-latency positive-negative complex found only over visual cortex. Lesions of the lateral geniculate nucleus eliminated the short-latency, positive-negative complex and left the long-latency negative wave unaffected. Possible developmental correlations were discussed in terms of morphological, electrophysiological, and behavioral changes as a function of age in the kitten.

A68-82212
PREOPERATIVE WATER DEFICITS AT 4,945 FEET ABOVE SEA LEVEL.

J. M. Wang, R. Whang, and D. E. Smith (N. Mex., U., School of Med., Depts. of Med. and Surg. and Veterans Admin. Hosp., Albuquerque).

Rocky Mountain Medical Journal, vol. 65, Sep. 1968, p. 35–39. 7 refs.

Grant PHS 5 RO1 HE 08673.

Observations of preoperative water deficits were made in Albuquerque, New Mexico situated at 4,945 ft. above sea level. On the basis of the present studies, two points merit emphasis: (1) the mean preoperative deficits in seven patients were found to be 641 ml. measured over a ten-hr. study period; (2) from this observation it is estimated that in this locale net 24-hr. insensible losses approximate 1,269 ml.

A68-82213
CARBON MONOXIDE UPTAKE IN THE GUT.
Ronald F. Coburn (Pa., U., School of Med., Depts. of Physiol., Graduate Div., and Med., Philadelphia).
Annals of the New York Academy of Sciences, vol. 150, Feb. 26, 1968, p. 13–21. 19 refs.
Grants PHS 5-RO1-HE-10331 and PHS K2-HE-11,574.

Measurements of CO absorption in hollow organs can be used to determine the permeability of the mucosal membrane as well as the rate of blood flow through gas-exchange vessels. From measurements of mucosal permeability and blood flow it is possible to predict mechanisms of absorption of inert gases, and it is suggested that rates of absorption of H_2, N_2, and CH_4 in stomach, ileum, and colon are limited primarily by the rate of blood flow and minimally by diffusion.

A68-82214
THE ROLE OF INTESTINAL FLORA IN GAS FORMATION.
L. S. Gall (IBM Corp., Space Systems Center, Bethesda, Md.).
Annals of the New York Academy of Sciences, vol. 150, Feb. 26, 1968, p. 27–30. 7 refs.

The role of intestinal flora in gas formation is discussed. Flatus may be troublesome during space flight in the healthy astronaut because of extreme inactivity posture, space diet and decreased atmospheric pressure. The types, numbers and relative predominance of microorganisms present in the intestinal tract are of primary importance in determining the composition and volume of gas produced. Two main factors which influence the intestinal microflora are the environment in the various segments of the intestine and the quantity and composition of the substrate available to the microorganisms. Better understanding of the role of the individual predominating intestinal microorganisms in gas formation and of the effect of diet on this microflora appears to be a practical means of controlling flatus production.

A68-82215
INTESTINAL RESPONSE TO CHANGING GASEOUS ENVIRONMENTS: NORMOBARIC AND HYPERBARIC OBSERVATIONS.
Herbert A. Saltzman and Herbert O. Sieker (Duke U., Med. Center, Durham, N. C.).
Annals of the New York Academy of Sciences, vol. 150, Feb. 26, 1968, p. 31–39. 20 refs.
Grants PHS HE 07896, PHS HE 5662, PHS HE 5663, and PHS AI 00031; Life Insurance Med. Res. Fund supported research.

The gases within the intestinal lumen reflect the composition and volume of swallowed respiratory gas, the kinds and amount of nonrespiratory gas produced within the intestine by bacterial fermentation, the rate of gaseous exchange between the intestinal lumen and circulating blood, and finally, the rate of release of intraluminal gas from the alimentary orifices. At equilibrium the intestine behaves as a closed collapsible gas-containing cavity with intraluminal tensions of respiratory gases approaching values found in venous blood. Repiration of pure oxygen lowers the nitrogen tension in tissues, and accelerates the transfer of intestinal gas into blood with ultimate elimination in expired gas. This physiological principle has been used to advantage in the decompression of experimental and clinical intestinal obstruction. Exposure to oxygen at increased hyperbaric pressure augments this accelerated removal of intestinal gas, but extensive clinical application requires an elaborate facility and specially-trained personnel. The availability of effective alternative measures for treating intestinal distention will probably limit the clinical use of hyperbaric pressures to institutions that have already developed the necessary resources. The respiratory responses to alimentary gas infusions demonstrate clearly the rapid interchange between soluble diffusible intestinal gas and the lungs. Infusion of carbon dioxide into the rectum of awake supine man leads shortly thereafter to an increase in pulmonary ventilation until the excess carbon dioxide has been eliminated. The infused gas appears rapidly in expired air. The role of arterial chemoreceptors in stimulating ventilation could not be evaluated definitively, although increased carbon dioxide tensions and hydrogen ion concentration became evident only in central venous blood. The use of intraluminally-infused oxygen to prevent ischemic necrosis of intestine, although effective under certain conditions in small animals, proved of no value in dogs after total interruption of the circulation. Therapeutic application of normobaric or hyperbaric oxygen therapy using combined respiratory and alimentary routes of delivery, in a clinical setting of reduced perfusion, may, however, merit further trial.

A68-82216
GASTROENTEROLOGIC ASPECTS OF MANNED SPACEFLIGHT: COMMENTS ON GASTROINTESTINAL GAS AND ENVIRONMENTAL STRESS.
Carl J. Pfeiffer (Harvard School of Public Health, Guggenheim Center for Aerospace Health and Safety, Boston, Mass.).
Annals of the New York Academy of Sciences, vol. 150, Feb. 26, 1968, p. 40–48. 43 refs.

The influence of various environmental stresses that are encountered during manned spaceflight were briefly discussed in regard to both general gastroenterologic responses and specific effects on gastrointestinal gas. Among the numerous stresses encountered during spaceflight (gravitational stress, vibration, thermal stress, psychologic and physiologic fatigue, irradiation, weightlessness, et cetera), only those stresses that occur for extended periods of time and therefore interfere with digestive function are considered problematical. Thus, significant gastrointestinal problems have not been observed during short-term manned spaceflights, but may occur during extended flights lasting several months. The question of gastrointestinal gas behavior during spaceflight was reviewed, and it is suggested that the factors of diet and psychologic stress be considered primary sources of possible difficulty during extended spaceflights. Other factors, such as weightlessness, lack of exercise, and atmospheric gas composition, theoretically can be expected to influence gastrointestinal gas composition or behavior, but these factors would appear to be less important in our present, unknowledgeable state. Further and initial experimentation, especially concerning quantitative analyses of gas production in humans in ground-based experiments with environmental stress and special diets, as well as general gastroenterologic experiments undertaken during spaceflight, will be of value.

A68-82217
HYDROGEN AND METHANE PRODUCTION IN MAN.
Michael D. Levitt and Franz J. Ingelfinger (Boston U., School of Med., Dept. of Med. and Med. Center and Boston City Hosp., Fifth and Sixth (BU) Med. Serv., Mass.).
Annals of the New York Academy of Sciences, vol. 150, Feb. 26, 1968, p. 75–81. 6 refs.
Grants PHS T1 AM 05025 and PHS AM 03560.

A constant-infusion technique was used to obtain quantitative data on intestinal gas production in man. The production of H_2 occurred in all subjects and was almost completely dependent upon ingested fermentable substrates. Although H_2 was detectable in the small intestine, virtually all of the H_2 was produced in the large bowel. In comparison, methane production was found in about half the subjects, was strictly limited to the colon, and was dependent upon unknown substrates.

A68-82218
THE USE OF EXPIRED AIR TO MEASURE INTESTINAL GAS FORMATION.
Doris Howes Calloway (Calif., U., Berkeley) and Edwin L. Murphy (U.S. Agr., Dept., Western Reg. Utilization Res. Lab., Albany, Calif.).
Annals of the New York Academy of Sciences, vol. 150, Feb. 26, 1968, p. 82–95. 9 refs.

Breath hydrogen concentration varies in the course of the day and in response to the diet and the emotional state of the subject. Breath methane concentration is normally stable throughout the day but shows cyclic variation over periods of one to ten days' duration. Hydrogen is alwasy present, but 30% of the population has little or no detectable methane in expired air.

A68-82219
THE CLINICAL GAS SYNDROMES: A PATHOPHYSIOLOGIC APPROACH.
Ivan E. Danhof (Tex., U., Southwestern Med. School, Dept. of Physiol., Dallas).
Annals of the New York Academy of Sciences, vol. 150, Feb. 26, 1968, p. 127–140. 47 refs.

Three sources of gastrointestinal (GI) gas are recognized: (1) air, (2) carbon dioxide; and (3) fermentative gases–CH_4, H_2, and H_2S. Symptoms of "gaseousness," including eructation, gastric and abdominal distention, flatulence, and pain, occur when abnormal amounts of intestinal gas are acquired or produced that exceed the normal mechanisms of elimination, or when normal amounts of intraluminal gas cannot be eliminated with sufficient rapidity because of dysfunction in these eliminatory mechanisms. The oxygen transit time (OTT) evaluation furnishes a means of quantitatively assessing gaseous gastric-to-rectal transit, with the use of oxygen as the tracer. The test also flushes the GI tract of contained gases, which upon analysis reflect which source gas(es) may be implicated as being responsible for the symptomatology observed. The OTT data, together with the findings of ancillary tests of GI function (gastric analysis, hormone-stimulated duodenal drainage, carmine marker passage, stool analysis and excretion rate, and colonic rectosigmoid motility), furnish the information necessary for separating patients with gaseousness into groups based on pathophysiologic mechanisms. Suggestions for facilitating the diagnosis and treatment of the clinical gas syndromes in 88 patients are presented.

A68-82220
ELECTRONIC SYNTHESIS OF THE AVIAN RETINA.
Ronald G. Runge, Mas Uemura, and Sam S. Viglione (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Astropower Lab., Newport Beach, Calif.).
IEEE Transactions on Bio-medical Engineering, vol. BME-15, Jul. 1968, p. 138–151. 16 refs.
Contract AF 33(615)-3726.

An electronic model, based upon reported physiological and anatomical findings and capable of replicating the optical-to-electrical transformations performed by the avian retina was constructed. The purpose for the development of the model is briefly discussed. A review of the pertinent physiological and anatomical investigations upon which the model is based is presented. The techniques used for electronically modeling the six functional classes of ganglion detectors of the pigeon retina are described. The development of the model has demonstrated that the complex data processing of the retina can be electronically synthesized. In construction of the model it has been necessary to clearly define the performance and interconnection arrangement of each anatomically distinct neuron of the retina; hence, the model presents a postulate for the theory of operation of cone retinas with scotopic stimuli.

A68-82221
TEMPORAL STABILITY AND INDIVIDUAL DIFFERENCES IN THE HUMAN EEG: AN ANALYSIS OF VARIANCE OF SPECTRAL VALUES.
Jan Berkhout and Donald O. Walter (Calif., U., Brain Res. Inst., Space Biol. Lab., Los Angeles).
IEEE Transactions on Bio-medical Engineering, vol. BME-15, Jul. 1968, p. 165–168. 8 refs.
NASA Contract NAS 9-1970, Grants PHS FR-3, and PHS NB 02501.

Normalized power spectra was determined for each of a series of 30 five- and ten-sec. epochs of eight-channel electroencephalograph (EEG) recordings, taken from 47 subjects under conditions of rest and perceptual task stress. The data thus obtained were evaluated by an analysis of variance to determine their dispersion characteristics. In the eyes closed resting case, all channels and frequencies demonstrated statistically significant spectral differences between individuals, when compared to the dispersion of values within individuals. The temporal stability of the EEG was itself a significant factor in discriminating individuals. During performance of a visual task, spectral individuality was greatly decreased in the frontal-temporal region, while maintained in the parieto-occipital area. Distinctive behavior of certain specific frequencies was noted.

A68-82222
INTEGRATING FLOWMETER FOR MEASURING UNIMPAIRED ORAL AND NASAL AIRFLOW.
Joseph H. Worth, James C. Runyon, and Joanne D. Subtelny (Eastman Dental Center, Rochester, N. Y.).
IEEE Transactions on Bio-medical Engineering, vol. BME-15, Jul. 1968, p. 196–200.
Grant PHS DE-01837.

The integrating flowmeter is designed to measure unimpaired oral and nasal airflow during speech. The flow fields (oral and nasal) are sampled by two independent arrays of warm-wire velocity sensors. By adding linearized indications of these velocities samples, oral and nasal flows are determined. A desired frequency response of 250 Hz. is achieved by using short pieces of 12.7-μ platinum wire as sensors. Each sensor is maintained at a relatively constant temperature by means of feedback control. An operating temperature of 200°C. is used to minimize error caused by small changes in temperature of the exhaled air. Calibration was established by comparing measurements of vital capacity made using the integrating flowmeter a wet spirometer. Results obtained yielded an oral flow calibration of 1,250 ml./sec/V, with a standard deviation of 188 ml./secV over the normal range of airflow (0 to 1,200 ml./sec.). Because of inadequate sampling, nasal flow is measured with less accuracy. Some of the difficulties in recording airflow in free field during speech are discussed. Emphasis is given to the value of such recordings in speech research.

A68-82223
OXYGEN CONSUMPTION OF THE HEART: NEWER CONCEPTS OF ITS MULTIFACTORAL DETERMINATION.
Edmund H. Sonnenblick (Peter Brent Brigham Hosp., Cardiovascular Unit and Harvard Med. School, Boston, Mass.), John Ross, Jr., and Eugene Braunwald (Natl. Heart Inst., Cardiol. Branch, Bethesda, Md.).
American Journal of Cardiology, vol. 22, Sep. 1968, p. 328–336. 66 refs.
Grants PHS 9373-2 and AHA 9171-2.

The development of tension and the contractile state of the myocardium are the primary determinants of myocardial oxygen consumption. Recognition of these two factors and their interrelation has served to explain a number of apparent discrepancies in the literature. Other factors, including basal myocardial oxygen

consumption, activation energy and external work, also contribute to the myocardial oxygen consumption, but to a relatively minor extent. An understanding of these general principles should permit a more rational consideration of the determinants of myocardial oxygen consumption and the implications of these factors in disease states.

A68-82224
HISTOCHEMICAL STUDY OF EFFECTS OF HYPOXIA AND ISOPROTERENOL ON RAT MYOCARDIUM.
Nelson R. Niles, Jessie D. Zavin, and Robert N. Morikado (Ore. U., Med. School, Dept. of Pathol., Portland).
American Journal of Cardiology, vol. 22, Sep. 1968, p. 381–388. 30 refs.
Grant AHA 65G34 and Ore. Heart Assn. supported research.

Environmental hypoxia caused myocardial degeneration in rats. The changes appear with two hr. and were most severe at 14 to 18 hr., decreasing thereafter, even under the continuing hypoxia. Focal necrosis, however, became apparent in areas of degeneration at 12 hr. and was later replaced by scar. The findings are similar to those resulting from injection of iso-proterenol. This was a cytochemical and histologic study. The changes noted relate to unmasking of intracellular phospholipid and to disturbance of hydrogen-transport systems. These important constituents of the cells may be severely compromised before any abnormality is apparent histologically. Thus, some partial explanation is offered for the discrepancy commonly apparent in anatomically normal yet malfunctioning myocardium.

A68-82225
CORONARY IMPLICATIONS OF HEMODYNAMIC CHANGES CAUSED BY PHYSICAL TRAINING.
M. Heikki Firck (Helsinki U., Central Hosp., First Dept. of Med., Cardiovascular Lab., Finland).
American Journal of Cardiology, vol. 22, Sep. 1968, p. 417–425. 79 refs.
Finn. Heart Assn. supported research.

Studies of hemodynamic response to physical training have been reviewed to determine if regular physical acticity favorably influences the denominator in the ratio between oxygen supply and demand of the heart. It was found that the beneficial effect of the relative bradycardia achieved by training was only partially eliminated by the heart volume increment. Pressures in both lesser and greater circuits appear to remain uninfluenced. The same is true for the cardiac output both at rest and during short-term submaximal exercise. It is concluded that physical training of healthy subjects decreases the oxygen requirements of the heart. This response is likely to persist with continued but less intensive activity and may also last without any further excess activity if the primary exercise phase has been long and vigorous. The epidemiologic implications of the hemodynamic changes are briefly discussed.

A68-82226
CHANGES OF POTASSIUM IN THE ORGANISM FOLLOWING HYPERTHERMIC BATH AS REFLECTED IN EKG [ZMENY KALIA V ORGANIZME A ICH ODRAZ V ELEKTROKARDIOGRAME PO HYPERTERMICKON KUPELI]
M. Matej, J. Hupka, and J. Kolesár.
Fysiatricky a Reumatologicky Vestnik, vol. 46, June, 1968, p. 166–170. 16 refs. In Czech.

The authors studied potassium shifts following hyperthermic water bath in a group of ten normal women. The bath lasted 30 min. and half of that time the body temperature was kept by 3° C. above that measured before the bath. A statistically significant shift of pH of blood in the alkaline direction with passage of intracellular potassium through the extracellular space into the urine was found. The pH of urine shifted in the alkaline direction and the specific gravity of urine increased. The described shifts of potassium were accompained by changes in the electrocardiogram, e. g. by a statistically significant decrease of the T-wave in the second lead and prolongation of the Q–T interval.

A68-82227
CHANGES OF NEUROMUSCULAR EXCITABILITY DUE TO STANDING POSTURE [ZMENY NERVOSVALOVE DRAZDIVOSTI ZPUSOBENE STOJEM].
V. Raušer, J. Reháček, and R. Pavlansky.
Fysiatricky a Reumatologicky Vestnik, vol. 46, Jun. 1968, p. 171–174. 5 refs. In Czech.

The author studied, with the aid of functional electrodiagnosis, neuromuscular excitability and accomodation capacity of some muscles of the lower extremity and patients following operation of the hip joint. Previous papers have shown changes of the parameters before operation, after immobilization and in suspension. The present paper demonstrates changes of excitability and changes due to trophic effects which appear when the patient stands up after bedrest. Decrease of excitability was demonstrated in those muscles which had not been prepared for the standing posture by physical rehabilitation.

A68-82228
CATABOLITE REPRESSION AND ENZYME INHIBITION BY MOLECULAR HYDROGEN IN HYDROGENOMONAS [KATABOLISCHE REPRESSION UND ENZYMHEMMUNG DURCH MOLEKULAREN WASSERSTOFF BEI *HYDROGENOMONAS*].
F. Blackkolb and H. G. Schlegel (Göttingen, U., Inst. für Mikrobiol., West Germany).
Archiv fur Mikrobiologie, vol. 62, Jul. 8, 1968, p. 129–143. 23 refs. In German

In *Hydrogenomonas H 16* molecular hydrogen suppresses the adaptation to fructose and the synthesis of the enzymes of the Entner–Doudoroff (ED) degradative pathway is repressed. A similar response to molecular hydrogen has been observed in all (58) strains of hydrogen bacteria tested so far. In autotrophically grown cells of *H 16* the adaptation not only to fructose, but to gluconate, fumarate, citrate, isovalerate, asparagine, L-leucine and other amino acids is suppressed by hydrogen. At least two mechanisms are involved in the action of molecular hydrogen on the utilization of fructose: a repression of the synthesis of enzymes participating in the ED degradative pathway and in inhibition of the enzyme system in fully induced cells. *In vivo* this inhibition results in a decrease of the rates of growth or formation of poly-β-hydroxybutyric acid by 80%. In *Hydrogenomonas H 16* gluconate is also catabolized via the ED pathway. Gluconokinase and the ED enzymes 6-phosphogluconate dehydrase and 2-keto-3-deoxy-6-phosphogluconate aldolase are present in the cell free extracts of gluconate-grown cells. The adaptation of autotrophically grown cells to gluconate is also repressed by molecular hydrogen. However, hydrogen does not inhibit the function of these enzymes in gluconate grown cells. Therefore, the point of attack of the inhibition effected by molecular hydrogen could be localized as an inhibition of one or more enzymes of the ED pathway before the entrance of gluconate. The inhibition effected by hydrogen is probably caused by the action of ATP and of $NADH_2$ on glucose-6-phosphate dehydrogenase. The substrate saturation curve of this enzyme is sigmoid.

A68-82229
AUDIOMETRICAL EXAMINATION RESULTS OF 748 RETRAINEES ON DIESEL-ENGINES IN THE ERFURT RAILWAY DIRECTION [ERGEBNISSE AUDIOMETRISCHER

UNTERSUCHUNGEN VON 748 DIESELLOK-UMSCHULERN DER REICHSBAHNDIREKTION ERFURT].

G. Bente (Med. Dienst des Verkehrswesens, Erfurt, East Germany). *Verkehrsmedizin und ihre Grenzgebiete,* vol. 15, May 1968, p. 179–190. In German.

Seven hundred and forty-eight employees were examined clinically and audiometrically by otolaryngologists of the Traffic Medical Service before becoming retrained for work on diesel engines. Before this special examination a fitness pre-examination was done by the railway surgeon. The subjects were divided into three age groups. Their fitness for work on diesel engines was assessed in consideration of audiometrically established curves of a minimum hearing loss. Sixty-one percent of the employees had normal hearing. Six hundred and twenty employees (83% of those examined) were fit for working on diesel engines. Four hundred and sixty employees had normal hearing, and 160 showed an insignificant audiometrical and clinical hearing loss which does not exceed the established curves. One hundred and twenty-eight (17% of those examined) were unfit for working on diesel engines because their hearing exceeded the audiometrically critical curves. Nine of them were even unfit for working on steam engines, while all other 119 were considered fit for further work in steam engines. Seventy-nine of 128 subjects as well as 11% of all examined persons had to take occupational disease proceedings because they were suspected of suffering from noise-induced hearing loss. The question arises as to whether or not the railway surgeon is able to pre-select for a reference to the expert and thus decide fitness for work on diesel engines. A comparison of the clinical findings of examinations by the railway surgeon and those clinical and audiometrical results gained by otolaryngological experts shows that this question must be answered negatively. Considering the results, it seems to be possible only through otolaryngological examinations including audiometry, to gain well defined results which make possible a decisive fitness evaluation. Only by means of audiometry can early registration of all persons with a hearing decrease and noise induced hearing loss and a control of their further course be guaranteed.

A68-82230

THE EFFECTS OF DIFFERENT LEVELS OF WATER DEFICIT ON PHYSIOLOGICAL RESPONSES DURING HEAT STRESS.

N. B. Strydom and L. D. Holdsworth (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab., Johannesburg, South Africa).

Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jul. 29, 1968, p. 95–102. 10 refs.

The influence of different levels of water deficit on the physiological responses to heat stress of two well-acclimatized subjects was studied. The subjects worked continously at a rate of 2,000 ft. lb./min. for four hr. at 32.2° C. wet bulb, 33.9° C. dry bulb and an air velocity of 0.25–0.4 m./sec. Man, even when in water deficit, operates most efficiently when he replaces all the fluids lost is sweat and urine by drinking water in small amounts at frequent intervals. When a specific level of water deficit is maintained throughout the four hr. of heat exposure body temperature, heart rate, and sweat rate reach equilibrium at values which are significantly different from those recorded under conditions of complete water balance; the more severe the level of dehydration the higher the body temperatures and heart rates, and the lower the sweat rates. No indication of any failure of the temperature regulating mechanisms or fatigue of the sweet glands was found and a possible explanation for this difference with previously reported results is provided.

A68-82231

CHANGES OF THE END EXPIRATORY LEVEL AND THE UTILIZATION OF LUNG RESERVE VOLUMES DURING EXERCISE.

J. Vavra and M. Máček (Charles U., Fac. of Pediat., Res. Lab. of Phys. Fitness, Prague, Czechoslovakia).

Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jul. 29, 1968, p. 124–130.

The end expiratory lung volume was measured at various levels of minute ventilation during exercise by the nitrogen wash-out method in 22 healthy young subjects. Tidal volume increased only from the inspiratory reserve volume until it reached the value of 40% of the vital capacity. There was no shift of the end expiratory position. With a tidal volume larger than 40% of the vital capacity the end expiratory lung volume decreased, which means that the tidal volume increased at the expense of the expiratory reserve volume. No differences were found between men and women providing that all values were expressed as a percentage of the total lung capacity.

A68-82232

INFLUENCE OF BICYCLE ERGOMETER EXERCISE IN THE RANGE OF THRESHOLD LIMITS ON THE BODY TEMPERATURE [DAS VERHALTEN DER KORPERTEMPERATUR BEI FAHRRADERGOMETERARBEIT IM BEREICH DER AUSDAUERGRENZE (PWC130)].

D. Clasing and U. Laumann (Münster i. Westf., U., Inst. für Sportmed., West Germany).

Internationale Zeitschrift für Angewandte Physiologie, vol. 26, Jul. 29, 1968, p. 131–140. 29 refs. In German.

Kuratorium für Sportmed. Forsch. e. V. supported research.

Forty male volunteers, 20 trained and 20 untrained, worked on a bicycle ergometer at loads up to a heart rate of 130±5 beats/min. for two hr. Rectal temperature was measured continuously with a thermocouple. During muscular exercise the body temperature increases continuously to a new level which is reached after 57 (trained) and 58 min. (untrained). This level corresponds with the end temperature of 38.26° C. (trained) and 38.27° C. (untrained). The increase of the medium temperature curves of trained and untrained are nearly equal though the work done by the trained is almost 25% larger. The same behavior of the body temperature of trained and untrained students during exercise at a heart rate of 130±5 beats/min. shows that there is no correlation between the absolute work load and the rectal temperature. But it is demonstrated that to a certain state of circulation there belongs a definite rectal temperature.

A68-82233

HEART FREQUENCY OF WELL TRAINED ATHLETES DURING TRAINING IN MEXICO CITY [DAS VERHALTEN DER HERZFREQUENZ WAHREND DES TRAININGS VON HOCHLEISTUNGS-SPORTLERN IN MEXICO CITY].

J. Keul, K. Scharf, and J. Nöcker (Med. Universitätsklin., Freiburg i. Br., West Germany).

Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jul. 29, 1968, p. 150–163. 25 refs. In German.

Deut. Forschungsgemeinschaft and Kuratorium für Sportmed. Forsch. supported research.

Telemetric measurements of runners, rowers and cyclists in Mexico City (2,250 m. above sea level) are reported. The heart frequency shows similar increases and changes to sea level. The heart frequency during training lies slightly above the values measured in the laboratory during ergometric work. As far as heart frequency is concerned, the ergometric values may thus be compared in the training values. No indications of damage due to

high altitude conditions in Mexico City were found. The intensity and length of the exercise performed have a limited influence on the level of heart frequency.

A68-82234
THE POTENTIATING EFFECT OF LOW OXYGEN TENSION EXPOSURE DURING TRAINING ON SUBSEQUENT CARDIOVASCULAR PERFORMANCE.

E. W. Banister, R. C. Jackson, and J. Cartmel (Brit. Columbia, U., Vancouver, Canada).

Internationale Zeitschrift für Angewandte Physiologie, vol. 26, Jul. 29, 1968, p. 164–179. 13 refs.

Natl. Health and Welfare, Dept. supported research.

The effect of exhaustive bicycle ergometer training in hypoxia (FIO_2 0.110–0.125) on several cardiovascular parameters was measured in an Olympic oarsman by serial measurements made daily over a period of three mo. The hypoxic training had a potentiating effect on ventilation and oxygen uptake both of which attained upper limiting values in all-out tests at the end of one mo. of training. Acid-base balance changes were measured from arterialized capillary blood and showed a decreasing negative base excess (BE) and low pH response to exhaustive exercise. It was hypothesized that once maximum oxygen intake ability has been developed an additional training effect was shown either by an increasing buffering capacity to non-volatile acid or by improved oxygen transport at tissue level so that there was a diminished need for an exergonic process of the type glycogen to lactic acid. The effect of interposing normoxic training during the middle month of the whole exercise period negatively affected exhaustive tests in hypoxia but had much less effect on the rate of improvement in exhaustive normoxic tests.

A68-82235
REGULATION OF CIRCULATION, REFLEX AND REACTION TIME DURING THE PHASE OF INTESTINAL REABSORPTION AFTER INTAKE OF ETHYL ALCOHOL [KREISLAUFREQULATION, REFLEX-UND REAKTIONSZEIT IN DER RESORPTIONSPHASE NACH ALKOHOLEINWIRKUNG].

H. Rieckert, H. P. Closs, and P. Pauschinger (Tübingen, U., Physiol. Inst., West Germany).

Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jul. 29, 1968, p. 180–188. 31 refs. In German.

The regulation of blood flow in healthy subjects was investigated before and after the oral administration of one g. ethyl alcohol/kg. body weight during orthostatic stress: (a) by the Hocktest; (b) by the measurement of the additional blood volume in the leg by tilting the whole body; and (c) by the pressure-volume diagram of the calf. The reaction ability of the circulatory system to ethyl alcohol differs individually. It is partly increased and partly decreased. It is supposed that this effect might be explained by the different velocity of increase of the blood alcohol and by the different initial physical and psychic dispositions. The blood flow of the finger and forearm differs in the same way. The reaction time was always increased. The Achilles tendon reflex was not influenced. The same investigations were done after the ingestion of milk and cottage cheese. This procedure decreased significantly the level of blood alcohol and the reaction time.

A68-82236
KERATINOLYSIS OF WOOL BY *KERATINOMYCES AJELLOI* [KERATINOLYSE DE LA LAINE PAR KERATINOMYCES AJELLOI].

Yves Moschetto, Jacqueline Ragot, and Gerard Biserte (Toulouse, U., Fac. des Sci., Lab. de Cryptogamie, France).

Bulletin de la Societe de Chimie Biologique, vol. 50, no. 4, 1968, p. 751–758. 20 refs. In French.

The action of *Keratinomyces ajelloi* on wool was studied. Twenty to 30% of the fiber weight was hydrolyzed while at the same time, cortical cells may be liberated, as happens in a peptic hydrolysis. At the end of the reaction, it was possible to isolate reduced keratins from the residual wool by the action of kalium thioglycolate at pH 11. Treatment with mono-iodoacetic acid led to S-carboxymethylkeratins (SCMK). SCMK behavior was studied by gelfiltration of Sephadex G200 and by starch gel electrophoresis at pH 8.6 with 8 M urea. The ratio Ve/Vo (Ve = eluted volume; Vo = void volume), the number and the positions of the SCMK electrophoretic bands were very different in dermatophyte treated wool and in natural wool. These observations prove the keratolytic action of K. ajelloi.

A68-82237
THE HEART DYNAMICS AT LOW HEART RATES [UNTERSUCHUNGEN UBER DIE HERZDYNAMIK BEI LANGSAMER HERZFREQUENZ].

E. Wolner (Vienna U., II. Chir. Klin. and Pharmakol. Inst., Austria).

Pflugers Archiv fur die gesamte Physiologie, vol. 301, Jun. 11, 1968, p. 187–197. 33 refs. In German.

In anesthetized dogs, without opening the thorax, determinations were made of the coronary blood flow, oxygen consumption, cardiac output, cardiac work and the aerobic cardiac efficiency at a slow heart rate (20–100 beats/min.) and constant arterial mean pressure. The retardation of the heart rate was achieved through mechanical irritation of the A-V-node. The coronary blood flow was within normal limits of 70–100 ml./min./100 g. and decreased linearly to 40 ml./min./100 g. at a heart rate of 20 beats/min. It was found that there was a direct correlation of the coronary blood flow to the square root of the heart rate. The relationship of oxygen consumption to the heart rate was similar to the coronary blood flow because the coronary arterio-coronary venous oxygen difference was constant between 10–14 vol-% at all heart rates measured. Thus, at a rate of 20 beats/min. the heart used five ml./100 g./min. oxygen and at a rate of 80 beats/min. 10 ml./100 g. Within the limits of normal heart rate, the cardiac output was four l./min. and with diminishing rate decrease to one l./min. whereby there was a simple linear relation between heart rate and cardiac output. The aerobic cardiac efficiency was 20–25% at normal heart rates and it decreased with the square root of the heart rate as the rate diminished. However, by rates less than 40 beats/min. a lower cardiac efficiency was found, because in the calculation of the efficiency only the pressure work was contained.

A68-82238
METABOLISM OF SKELETAL MUSCLE. 1. GLUCOSE, LACTATE, PYRUVATE AND FREE FATTY ACIDS IN ARTERIAL AND VENOUS BLOOD OF WORKING MUSCLES. EXAMINATIONS OF WELL TRAINED ATHLETES [ZUM STOFFWECHSEL DES SKELETMUSKELS. 1. GLUCOSE, LACTAT, PYRUVAT UND FREIE FETTSAUREN IM ARTERIELLEN UND VENOSEN BLUT DER ARBEITENDEN MUSKULATUR BEI HOCHLEISTUNGSSPORTLERN].

J. Keul, E. Doll, and D. Keppler (Med. Universitatsklin., Freiburg i. Br., West Germany).

Pflugers Archiv fur die gesamte Physiologie, vol. 301, Jun. 11, 1968, p. 198–213. 35 refs. In German.

In athletes the arterio-femoral-venous differences of glucose, lactate, pyruvate and free fatty acids were determined during rest, submaximal and maximal exercids and during recovery. Exercise was done on a bicycle ergometer. The O_2-pressure, pH and CO_2-pressure of the same blood samples were also determined. In rest, during and after exercise the skeletal muscle extracted glucose. The previous concept that the increased lactate production and the rise of the lactate/pyruvate ratio during physical exercise results

from hypoxia in the skeletal muscle was confirmed. The lactate formation during work was interpreted as a physiological aerobic glycolysis. During work, the lactate/pyruvate ratio was lower in the femoral venous blood than in the arterial blood; during recovery the venous value was higher than the arterial value. The extraction of free fatty acids and glucose by the working muscles increased during exercise. During rest the energy production was mainly due to carbohydrate oxidation. During submaximal and maximal work, through increased extraction of free fatty acids, nearly one-forth of the energy was obtained by oxidation of free fatty acids.

A68-82239

METABOLISM OF SKELETAL MUSCLE. 2. OXYGEN PRESSURE, CARBON DIOXIDE PRESSURE, pH, STANDARD BICARBONATE AND BASE EXCESS IN THE VENOUS BLOOD OF WORKING MUSCLES. EXAMINATIONS OF WELL TRAINED ATHLETES [ZUM STOFFWECHSEL DES SKELETMUSKELS. 2. SAUERSTOFFDRUCK, KOHLENSAUREDRUCK, pH STANDARDBICARBONAT UND BASE EXCESS IN VENOSEN BLUT DER ARBEITENDEN MUSKULATUR. UNTERSUCHUNGEN AN HOCHLEISTUNGSSPORTLERN].

E. Doll and J. Keul (Med. Universitätsklin., Freiburg i. Br., West Germany).

Pflugers Archiv fur die gesamte Physiologie, vol. 301, Jun. 11, 1968, p. 214–229. 20 refs. In German.

Deut. Forschungsgemeinschaft and Kuratorium für Sportmed. Forsch. supported research.

In 12 high performance athletes at rest, during work at the bicycle ergometer and during recovery, oxygen pressure, carbon dioxide pressure, pH, standard bicarbonate and base excess of the blood were measured. The values were compared with comparable data derived for untrained persons. Neither in the trained nor in the untrained persons was the critical venous oxygen pressure (vPO_2) reached during maximum exertion. This is evident not from the data concerning femoral vPO_2 during maximum exertion, but rather from the behavior of the lactate/pyruvate ratio. Continued high performance of a trained athlete at sea level is probably not limited by the oxygen supply to the muscle tissue or by the acidation of the blood or tissue. The decrease in the vPO_2 during exertion does not cause the increased lactate output, which is observed earlier and more intensively in untrained than in trained persons. Rather, this seems to be a result of limited oxidative cell performance. The following results, differing for athletes and non-athletes, indicate that during exertion athletes are characterized by a higher blood circulation level than untrained persons (this is probably an important factor in continued performance). During light activity, the athletes' vPO_2 decreases only minimally. A stress level of 200 w., representing maximal work for the non-athlete, represents only submaximum work for the athlete. Here the femoral vPO_2 amounts to about 21 m. Hg in both groups. The trained athlete is able to increase his performance further to 300 w., without a further significant decrease in vPO_2. This cannot be wholly explained by a right-hand shift of the O_2-dissociation curve under the influence of pH and temperature change. Only in the arterial blood pH under stress is determined chiefly by the lactate output. Venous pH is also significantly dependent on the CO_2-pressure. Neither in the arterial nor in the femoral venous blood do athletes show lower pH values under maximum stress than untrained persons. Therefore neither increased acidation of the tissue during maximum exertion, nor an increased acid tolerance of the tissue due to training, is probable.

A68-82240

THE DIAMETER OF THE INTACT CAROTID ARTERY IN MAN AND ITS CHANGE WITH PULSE PRESSURE.

Joachim O. Arndt, Jürgen Klauske, and Frank Mersch (Berlin, Free U., Dept. of Physiol., East Germany).

Pflugers Archiv fur die gesamte Physiologie, vol. 301, Jun. 11, 1968, p. 230–240. 20 refs.

Contract AF 61(052)-947 and Deut. Forschungsgemeinschaft supported research.

The pressure-diameter relationship of the intact human common carotid artery was studied in nine healthy subjects ranging in age between 24 and 34 yr. The diameter of the carotid artery was measured with an ultrasound-echo ranging device. The following results were obtained: (1) the pulsatile changes in diameter amount to 14.3 ± 2.5% which are appreciably larger than have been reported from exposed arteries; (2) the 0.86 and 0.77 and 0.97 cm., respectively; (3) each subject has a characteristic pressure-diameter curve; (4) the calculated volume elastic modulus of 0.23×10^6 dynes $\times$ cm.$^{-2}$ is a tenth of that calculated from exposed arteries; (5) the pulse wave velocity which has been calculated from the volume elastic modulus agrees perfectly with that measured directly along the common carotid artery. The data suggest that one has to be cautious when applying results from exposed or isolated arteries to the intact circulation.

A68-82241

THERMOREGULATION DURING PROLONGED, STRENUOUS EXERCISE [TEMPERATURREGULATION BEI LANGDAUERNDER SCHWERER KORPERLICHER ARBEIT].

J. Kitzing, D. Kutta, and A. Bleichert (Hamburg, U., Physiol. Inst., West Germany).

Pflugers Archiv fur die gesamte Physiologie, vol. 301, Jun. 11, 1968, p. 241–253. 17 refs. In German.

During two hr. of exercise (15 m.k.p./sec.) on the bicycle ergometer in different environments (−4 to + 32° C.) the following findings were obtained: (1) The time course of the body temperature (BT) measured in the lower esophagus, depends during the whole experiment on the climate. First the BT rises steeply, in the cold higher than in the warm. Then (after 20 to 30 min. exercise) the BT rises slowly in the warm, or falls slowly in the cold. The curves of BT at different climates intersect after about one hr. of exercise. (2) The oxygen consumption under the experimental conditions is independent of the environment temperature. (3) The weight loss is proportional to the environment temperature till 25° C. At a higher temperature the weight loss increases more steeply. (4) Between 0 and 11° C. the heart rate remains nearly constant during the work; with rising room temperature the heart rate increases continously. The experiments indicate that it is not necessary to suppose that resetting of the body thermostat takes place during exercise.

A68-82242

SOME PHYSIOLOGICAL PROBLEMS OF MANNED SPACEFLIGHT.

P. Howard (R.A.F. Inst. of Aviation Med., Farnborough, Great Britain).

Bio-Medical Engineering, vol. 3, Aug. 1968, p. 360–364.

Physiological problems involved in manned space flight were discussed. Repeated flights have shown that space capsules provide a comparatively safe form of transport, and that most of the stresses involved can be kept well within the limits of human tolerance. Physiological surprises have been few, and there is every hope that the questions raised by them will be answered by the partnership of biologists and engineers which has made manned spaceflights possible, successful, and profitable.

A68-82243
A FORCE ANALYSIS OF THE HIP JOINT.
J. F. Williams and N. L. Svensson (Melbourne, U., Dept. of Mech. Eng., Australia).
Bio-Medical Engineering, vol. 3, Aug. 1968, p. 365–370. 16 refs.

A three dimensional force and movement analysis of the hip joint is described for the static case of standing erect on one leg. It is shown that if the displacement of the center of gravity of the body posterior to a line joining the centers of the femoral heads is taken into account, the resultant hip reaction load is approximately six times the body weight. The results are compared with previous work in this field and the differences are discussed.

A68-82244
INFLUENCE OF MODERATE EFFORT (WANDERING) ON PULSE AND BLOOD PRESSURE IN MEDIUM ALTITUDE. CONTRIBUTION TO INQUIRY THE EFFECT OF PERSANTIN [DER EINFLUSS MASSIGER ANSTRENGUNG (WANDERN) AUF PULS AND BLUTDRUCK IN MITTLEREN HOHEN. BEITRAG SUR FRAGE DER PERSANTIN-WIRKUNG].
H. Eigelsreiter and J. Weimann (Innsbruck, U., Inst. fur Physiol., Austria).
Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jun. 6, 1968, p. 1–3. 7 refs. In German.

Traveling in medium altitude (2,000–3,000 m.) led to an increase of pulse-frequency and little diminution of systolic blood pressure. The results were in accordance with experiences of other authors. As the diminuted oxygen supply is apparently fully compensated by the organism, there is no effect to be found after giving Persantin to young male persons who are healthy and mountain trained, opposite to the behavior in great altitude.

A68-82245
SUBMAXIMAL LOAD AND MAXIMAL CAPACITY. 1. BIOCHEMICAL INVESTIGATIONS ON UNTRAINED MALES DURING PHYSICAL EXERCISE [SUBMAXIMALE BELASTUNG UND MAXIMALE BELASTBARKEIT. 1. BIOCHEMISCHE UNTERSUCHUNGEN AN UNTRAINIERTEN UNTER KORPERLICHER ARBEIT].
H. M. Wegmann, K. E. Klein, and H. Brüner (Deut. Versuchsanstalt für Luft- und Raumfahrt e.V., Inst. für Flugmed., Bad Godesberg, West Germany and Ill., U., Med. Center, Res. Resources Lab., Chicago).
Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jun. 6, 1968, p. 4–12. 19 refs. In German.

Twenty untrained male students were subjected to physical exercise on a bicycle ergometer at a load of 12 kpm./sec. for 30 min. Stress responses of nine parameters were evaluated by determinations of their concentration in venous blood. The activities of four cell enzymes (Aldolase, GOT, GPT, MDH), total cholesterol and free 17-OH-corticosteroids were measured in plasma; ascorbic acid, ATP and blood sugar were estimated in the whole blood. Furthermore, the maximal oxygen uptake of each subject was evaluated. Prestress values and stress responses of the blood parameters were examined for their correlations with each other and with the maximal oxygen uptake. The four enzyme activities, ATP and cholesterol responded with increases to the exercise stress, but blood sugar decreased. No significant changes were shown by the corticosteroids and the ascorbic acid. There was a lack of finding any greater and systematic correlations between the stress responses of the different blood parameters. Correlations to maximal oxygen uptake were observed for the stress values of GOT ($r = -0.45$), MDH ($= -0.50$ and $r = -0.59$) and ATP ($r = 0.45$, $r = 0.54$ and $r = 0.69$).

A68-82246
THE STROOP-TEST IN HIGH ALTITUDE. APROPOS THE EFFICIENCY OF PERSANTIN [UNTERSUCHUNGEN MIT DEM STROOP-TEST IN GROSSEN HOHEN. BEITRAG ZUR FRAGE DER PERSANTIN-WIRKUNG].
H. Eigelsreiter, M. Ritter, and J. Weimann (Innsbruck, U., Inst. für Exptl. Psychol. and Inst. für Physiol., Austria).
Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jun. 6, 1968, p. 13–20. 11 refs. In German.

Effect of high altitude (4100, 4650, 4560 m.) upon performance in the STROOP test was investigated including additional variations of this effect by giving Persatin (75 mg. p.o.). The real interference score was influenced neither by altitude nor by Persantin; the simple reading time however was influenced by both of them. In high altitude average speed of reading is enhanced but this effect is reduced (about one-third) by Persantin. A possible interpretation is discussed.

A68-82247
THE EFFICIENCY OF MUSCULAR WORK OF HEALTHY, YOUNG MEN BEFORE AND DURING ORAL APPLICATION OF TRI-IODOTHYRONINE [DER WIRKUNGSGRAD KORPERLICHER ARBEIT GESUNDER, JUNGER MANNER VOR UND WAHREND ORALER TRIJODTHYRONINZUFUHR].
W. Moll, H. L. Krüskemper, and K. H. Gillich (Med. Hochschule, Inst. für Physiol. und Med. Klin., Hannover, West Germany).
Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jun. 6, 1968, p. 21–25. 8 refs. In German.

Resting metabolic rate and efficiency of muscular work was measured before and during oral tri-iodothyronine application. When the dosage was 150 gamma/day, the resting metabolic rate was significantly increased after one day and seven days ($2\alpha = 0.02$ and $2\alpha = 0.01$, respectively). The efficiency of muscular work remained unchanged. These results show that the increase of the metabolic rate produced by a low dosage of tri-iodothyronine is not caused by a disturbance of energy transfer and/or energy utilization during muscular contraction. In contrary to the findings in persons after oral tri-iodothyronine application, the efficiency of muscular work was found to be decreased in 50% of patients with decompensated Grave's disease.

A68-82248
CALCULATION OF MUSCLE STRENGTH PER UNIT CROSS-SECTIONAL AREA OF HUMAN MUSCLE BY MEANS OF ULTRASONIC MEASUREMENT.
Michio Ikai and Tetsuo Fukunago (Tokyo, U., School of Educ., Japan).
Internationale Zeitschrift für Angewandte Physiologie, vol. 26, Jun. 6, 1968, p. 26–32. 7 refs.

By means of ultrasonic photography of the cross-section of the acting muscle bundle, together with the measurement of the muscle strength developed by the subject with maximum effort, the strength per unit area of the muscle was calculated in 245 healthy human subjects, including 119 male and 126 female. The results were summarized as follows: (1) The ultrasonic method used in this work was possibly admitted as the best way to calculate the cross-sectional area of the muscle. (2) The arm strength was fairly proportional to the cross-sectional area of the flexor of the upper arm regardless of age and sex. (3) The strength per unit cross-sectional area of flexor of the upper arm was 6.3 kg./cm.^{2} in the average, standard deviation of 0.81 kg./cm.^{2}. When a cross-sectional area of muscle was measured at extensive position of the forearm, the strength per unit area was calculated to be 4.7 kg./cm.^{2} at flexed position of the forearm. (4) As to the individual variation, the strength per unit area was distributed in a range from 4 kg./cm.^{2} to 8 kg./cm.^{2}. (5) The strength per unit cross-sectional

area was almost the same in males and females regardless of age. In addition to that, there was not found any significant difference in untrained and trained adults.

A68-82249
MEASUREMENT OF FORCES EXERTED ON PEDAL AND CRANK DURING WORK ON A BICYCLE ERGOMETER AT DIFFERENT LOADS.

M. J. A. J. M. Hoes, R. A. Binkhorst, A. E. M. C. Smeekes-Kuyl, and A. C. A. Vissers (Nijmegen, U., Med. Fac., Dept. of Physiol., The Netherlands).

Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jun. 6, 1968, p. 33–42. 27 refs.

Force measurements on the pedal and crank during work on a bicycle ergometer revealed that: (1) force exertion is maximal when the position of the pedal is in the front at about 90° to the vertical line; (2) the passive (hind) leg is lifted partly by the active (force exerting) leg, and this effect diminishes at higher loads; (3) peak loads in one cycle are about twice the load-setting on the specific ergometer; and (4) toe-clips on the pedals are probably not always used to pull at the pedals. The application of force measurements in several experiments concerned with ergometry and cycling is discussed.

A68-82250
RELATIONS BETWEEN BODY CORE TEMPERATURE AND PULSE RATE OF MAN PERFORMING PHYSICAL WORK UNDER WARM CLIMATIC CONDITIONS [UBER DIE BEZIEHUNGEN ZWISCHEN KORPERKERNTEMPERATUR UND PULSFREQUENZ DES MENSCHEN BEI KORPERLICHER ARBEIT UNTER WARMEN KLIMABEDINGUNGEN].

Hans Gerd Wenzel (Max-Planck-Inst. für Arbeitsphysiol., Dortmund, West Germany).

Internationale Zeitschrift fur Angewandte Physiologie, vol. 26, Jun. 6, 1968, p. 43–94. 108 refs. In German.
Europäische Gemeinschaft für Kohle und Stahl durchgeführte Forschungsarbeit supported research.

A young healthy man, nearly nude and adapted to heavy work in heat, performed different physical work on a treadmill in 105 working experiments, each work session lasting two to five and one-half hr. in the morning after rest in bed in normal room temperature. For each work experiment work level (metabolic rate about 170 to 450 kcal./hr.), room temperature (18 to 50°C., air temperature ≈ wall temperature) and relative humidity (11 to 97%) were combined in different ways, air speed always being 0.3 m./sec. Before and during work rectal temperature, ear temperature in the external acoustic duct, and heart rate were measured. Rectal temperature was higher than ear temperature during rest before work as well as at the end of each session. The heavier the performed work, the greater was the difference between both the final temperatures. It did not depend upon the combination of surrounding temperature and air humidity during work. Under warm climatic conditions ear temperature regularly increased at the beginning of work faster than rectal temperature and exceeded the latter by some 1/10°C. for some time under the heaviest climatic conditions which were combined with light work only. The heart rate reached at given work level under different climatic conditions at different times was usually higher at the higher rectal temperatures and faster as the rectal temperature increased. At given rectal temperatures during work at different levels, the heart rate was higher at heavier work loads. The relationship between heart rate and ear temperature was qualitatively similar, but quantitatively different. It is supposed that the relationships between heart rate and rectal and ear temperatures reflect a relationship between heart rate and the temperature of the working muscles. Such a relationship may be independent of work activity and physical environment at least under steady state conditions. It seems possible that the temperature of working muscles has some importance for the adjustment of heart rate. According to the combination of work level, room temperature, and air humidity either heart rate, rectal temperature, and ear temperature together reached steady levels during the experiments or they did not. The highest values of heart rate and rectal temperature which just remained constant with time depended upon work level, but not upon the combination of surrounding temperature and air humidity during work. These limiting values were 98 beats/min. and 37.7°C. for light work (metabolic rate about 170 kcal./hr.), 113 beats/min. and 38.0°C. for heavy work (320 kcal./hr.). The respective limiting values of ear temperature were similar for all the investigated work levels in the range 37.4° to 37.5°C. The different relationships between metabolic rate and body temperatures found under normal and warm climatic conditions led to the assumption that at physical work above the endurance limit under normal climatic conditions body temperatures do not reach steady states, so that heat accumulation plays a part in the limitation of physical endurance efficiency.

A68-82251
PRINCIPLES OF CIRCADIAN RHYTHMS IN MEN, STUDIED BY THE EFFECTS OF A WEAK ALTERNATING ELECTRIC FIELD [GESETZMASSIGKEITEN DER CIRCADIANEN PERIODIK DES MENSCHEN, GEPRUFT AN DER WIRKUNG EINES SCHWACHEN ELEKTRISCHEN WECHSELFELDES].

Rütger Wever (Max-Planck-Inst. für Verhaltensphysiol., Seewiesen and Erling-Andechs, West Germany).

Pflugers Archiv European Journal of Physiology, vol. 302, Jul. 29, 1968, p. 97–122. 22 refs. In German.
NASA Grant NSG 259-62.

The human circadian rhythm can be influenced regularly by a weak alternating electric field with a frequency of 10 c.p.s. In contrast to the effects of environmental illumination, this field which is imperceptible to the subject, is as effective during activity time (eyes open) as during rest time (eyes closed). In constant conditions, the values of the following parameters are statistically significantly higher for experiments with the field in operation than for those with the field not in operation: (1) free running frequency of activity rhythm and temperature rhythm; (2) activity time/rest time ratio; (3) mean value of rectal temperature; and (4) a form-coefficient, characterizing the shape of the oscillation of rectal temperature. Thus the defined quantities are positively correlated to each other, as predicted by a hypothesis about circadian rhythms. Furthermore, the phase relation between the rhythms of activity and temperature is regularly correlated to the free running frequency and the other defining quantities. Because of the sign of this correlation it follows that, by a change of a constantly operating environmental controlling factor, the temperature rhythm is more strongly influenced than the activity rhythm. On the other hand, in periodically changing conditions a Zeitgeber acts more strongly on the activity rhythm than on the temperature rhythm.

A68-82252
SHIFTS OF THE CARBON DIOXIDE-DISSOCIATION CURVE IN ACUTE RESPIRATORY ACIDOSIS AND ITS CAUSES [VERANDERUNGEN DER KOHLENSAURE-BINDUNGSKURVE DES BLUTES BEI AKUTER RESPIRATORISCHER ACIDOSE UND IHRE URSACHEN].

Dieter Böning (Cologne, U., Inst. für Normale and Pathol. Physiol., West Germany).

Pflügers Archiv European Journal of Physiology, vol. 302, Jul. 29, 1968, p. 133–148. 35 refs. In German.
Deut. Forschungsgemeinschaft supported research.

The purpose of this investigation was to investigate the standard bicarbonate decreases during a short respiratory acidosis. Therefore ten dogs were artificially ventilated alternatively with O_2 and CO_2–O_2 mixtures. The arterial CO_2 - pressure (p_aCO_2) increased up to 100–120 mm. Hg twice for a period of 50 min. The arterial pH, p_aCO_2, standard bicarbonate, plasma protein and hemoglobin concentrations, hematocrit and electrolyte concentrations in blood and plasma were determined. The plasma values were measured after anaerobic sampling of blood from the femoral artery (*in vivo*-values) and after equilibration of blood with 40 mm. Hg pCO_2 at 38°C., corresponding to the conditions of standard bicarbonate determination (*in vitro*-values). During the respiratory acidosis the standard bicarbonate decreased about three to four mval./1. compared with the periods of oxygen breathing. The hemoglobin content of the blood increased about one g.% probably caused by release of red cells from the spleen. The hematocrit rose overproportionally nearly 7% because of the water shift into the red cells. The concentration of Cl^- in blood remained almost unchanged while the concentration of NA+ decreased three to six mval./1. This was due to a sodium loss of the red cells of nearly 15 mval./1. cell water. The chloride concentration in the red cell water increased about 12 mval./1. During the equilibration under standard bicarbonate conditions chloride ions shifted back to the plasma where their concentration became higher than the corresponding *in vivo* value. The sodium concentration in plasma water was not significantly influenced by the equilibration. From these findings it can be calculated why during short respiratory acidosis the excess of alkali ions in plasma water is diminished under conditions of standard bicarbonate determination. The electrolyte shifts can be explained by the influence of the hydrogen ion concentration on the Donnan equilibria and on the activity of the ion pumps.

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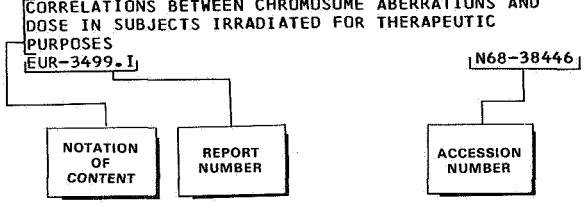

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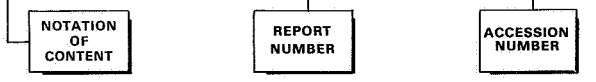

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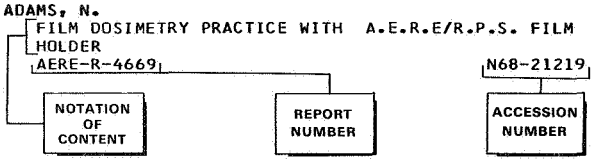

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